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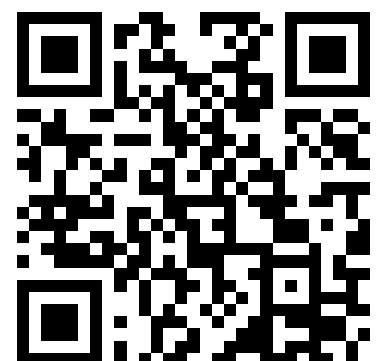
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EDITORIAL NOTES.

Another Submarine Telephony Failure.

Although one of our lead-
ing scientists recently
read an able and exhaus-
tive paper before one of
the electrical societies,
setting forth at great
length and with an immense amount of math-
ematical formulae a method of overcoming
static induction in submarine telephony, noth-
ing has come of his suggestion in a practical
way, and the solution of the problem of tele-
phoning through a submarine cable a distance
of one hundred miles, to say nothing of from
England to America, as has several times been
suggested by enthusiastic promoters, would
seem as far off as ever.

As every electrician is aware, the static in-
duction in a long submarine telephone cable
changes the quick, short sound waves into long,
slow vibrations impossible for the human ear
to detect. This was forcibly demonstrated in
a recent attempt to telephone under the Gulf
of Mexico from Havana, Cuba, to Key West, Fla.

The experiment was made by a representa-
tive of the Southern Bell Telephone Company
of Atlanta, Ga. Two long-distance telephones
of the most approved type were used, one in-
strument being connected with a cable in the
office at Key West, and the other with the
Havana end of the same cable. The report
states that after repeated trials and by the aid
of a vivid imagination the words "Hello" and
"I don't understand you" were distinguished
as coming from the operator at Havana, but
all further attempts at conversation proved
fruitless and the experiment was abandoned.
The representative of the Bell Company is re-
ported as saying that the voices sounded muf-
fled and were merely indistinguishable blurred
sounds.

From the above it will be seen this experi-
ment was no more successful than one made
some time ago—to telephone by cable between
Dry Tortugas and Key West. As the distance
between Havana and Key West is less than
two hundred miles and the distance across the
Atlantic ten times as great, as may readily be
inferred, it will probably be some time before
telephonic communication is established be-
tween this country and Great Britain, unless
by some such costly scheme as suggested by
Mr. Edison a couple of years ago, namely, by
means of a chain of innumerable relay ships.

A Range-Finder Telautographically Operated.

As is generally known
in naval warfare the
position of an ene-
my's ship relative to
a land battery or
another vessel is determined by means of range-
finders. These instruments usually indicate
automatically the exact distance and direction
of the target from the gun. This is accom-
plished by means of an elementary principle
of trigonometry applied to surveying. The
Fiske range-finder, which was made use of to a
considerable extent in the Spanish war, gives
the distance of an object from a ship by the
aid of an electric current working through two
rheostats and a wheatstone bridge. Observers
at the bow and stern of a ship follow the tar-
get with telescopes mounted on pivots. The
turning of the telescopes varies the resistance
of the rheostats and the changes in the inten-
sity of current move a range indicator in the
wheatstone bridge.

Another range-finder made use of by this
Government, to a limited extent, is that known
as the Lewis depression range-finder, which
calculates the distance by a method of triang-
ulation, the height of the instrument above sea
level forming the base of the triangle. This
type of range-finder, for various reasons, can-
not well be made use of on shipboard and was
designed essentially for coast service.

The war with Spain proved that the Fiske
range-finder was too delicate to withstand the
vibrations of the heavy guns, and, conse-
quently, in a naval engagement, soon became
useless. The Lewis range-finder has also de-
veloped several more or less serious defects,
and, in view of these facts, it is interesting to
note that a new range-finder, invented by an
Italian, was tried near Naples last November
with alleged extremely satisfactory results.
This Italian invention is called an exterior
angle horizontal base range-finder and con-
sists of three separate instruments: The
range-finder proper at the home-station,
the angle measure at the distant station, the
angle and range indicator at the battery.
These instruments give continually and auto-
matically at the battery the range and azi-
muth from the battery of any fixed or moving
target on which the telescope at the base end
stations may be directed. The automatic indi-
cator, by means of which the information ob-
tained at the home station is transmitted, in
corrected form, to the battery, is so arranged

as to show automatically on a dial the following data and commands: Attention; load; the elevation in degrees, minutes and seconds; the azimuth, also, in degrees, etc.

The electric transmission takes place by means of an improved Gray telautograph. The angle measurer can be turned as much as 60 degrees in a minute, which is much faster than any ship can move in azimuth, and yet the indications will be continuously correct.

The apparatus further admits of an extension which is still farther time-saving. The same data that are sent to the battery central station can be automatically repeated on the rear end of each carriage, so that every gun commander has constantly before him the range and azimuth (direction in a horizontal plane with reference to the meridian, or north and south line) of the target.

With the range-finders now in use this information must be called out by the battery commander through the telephone to the gun commanders, which not only delays matters, but also takes the time and attention of the battery commander. With this automatic arrangement he can devote all his energies to other more important matters. Every artilleryman, ashore or afloat, will appreciate the tactical value of this new range-finder, and will be grateful for such a practical solution of what has been a great stumbling-block problem, more especially in the indirect fire of coast guns on disappearing carriages. It is stated that this type of range-finder will shortly be adopted by not only Italy, but Japan as well.

* * *

Electrical Apparatus Admitted Free of Duty.

So much doubt has existed in the minds of customs officials and others as to what goods are entitled to entry free of duty that the Treasury Department some time ago called attention to these special provisions of the tariff. For instance, when entry is made of any article which is entitled to entry free of duty, the oath or declaration to that effect must be made at time of entry, and no bond for the subsequent production of same will be acceptable.

When instruments, etc., for use in colleges, etc., are imported, an affidavit of the fact must be made within seven days before their arrival by the secretary, treasurer, or other responsible officer of said institution, under its corporate seal, that such articles have been imported by the order and for the sole use of the institution, and not for distribution or sale.

According to different Treasury rulings, the following articles are classed as implements for mechanical or professional use in the arts and are such as are more usually employed in the trades and professions for performing operations incidental thereto, for instance: Grenet batteries, electric batteries for generating electricity, used largely in experiments; inductive Ruhmkorff coils, used for a variety of purposes; galvanometers, used for detecting electrical current; laboratory thermometers, unmounted, used for scientific purposes; Geissler tubes, used by scientists; anemometers, used for measuring the velocity of the wind; hygrometers, used for measuring moisture in the atmosphere; aneroid barometers, used for measuring pressure and weight of the atmosphere.

The following articles are held to be philosophical and scientific apparatus, utensils, instruments, and preparations within the meaning of and entitled to free entry under the provisions of paragraph 638 of the present tariff,

viz.: A scale indicating one-twentieth milligram, and a maximum weight of 100 grains; an analytical balance, sensitive to the seventeen-millionth of an ounce; electrical instruments, consisting of a standard resistance, an alternating current wattmeter, a Siemens' wattmeter; chemical laboratory hydrometer, maximum and minimum thermometers, and Kipp's apparatus.

The following articles are among those held not to be philosophical and scientific apparatus, utensils, instruments and preparations within the meaning of the paragraph named, and are therefore not entitled to free entry: Chemical thermometers; manganese; india-rubber tubing; electric storage batteries; dynamos, ammeters, voltmeters; compasses; railroad and rectilinear lenses; pocket compasses; Zander's mechanico-therapeutic apparatus; passometers; mathematical instruments; philosophical instruments imported for sale.

Under a decision of the Department it was decided that instruments, to be entitled to free entry, must be only such as are used for the purpose of making observations and discoveries in nature and developing and exhibiting natural forces and the conditions which they call into activity.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

THE world's investments, in the various applications of electricity, at the end of the past century may be estimated at not less than \$2,500,000,000.

NIKOLA TESLA is reported in the daily papers as having stated that while experimenting with his wireless telegraphy instruments in Colorado they were affected by some outside source, which he ingeniously attributes as an attempt on the part of the inhabitants of Mars to signal us. In the mind of an ordinary man these extraneous vibrations would probably be attributed to atmospheric electricity. But Mr. Tesla always had a vivid imagination.

PROF. ELISHA GRAY has recently invented a method of signaling under water, using the latter as the conveying medium, in much the same way that Hertzian waves are propagated through space. Sounds have been heard, so it is alleged, by this method a distance of twelve miles. The modus operandi of the system will be gone into more in detail at an early date.

PROF. FRANK PARSONS, of Boston, president of the National League for Promoting the Public Ownership of Monopolies, testified on January 5 before the Industrial Commission in Washington, on the subject of the telephone service of the country generally, and that of the District of Columbia in particular. He said from \$30 to \$35 a year for an unlimited service with only one instrument on a line would be a fair rate in any of the large cities. He further stated that telephone rates are higher in this country than anywhere in Europe.

STUDENTS of the smoke-consumption problem are directing attention just at present to certain experiments which have been conducted in London with a view to develop the possibilities of electricity as an agent for pre-

venting the smoke nuisance. Thus far, says the "American Inventor," the work has not reached the practical stage, but it appears from the tests already made to be feasible to equip large chimneys or furnaces with an electrical apparatus which will condense the smoke by the attraction of a powerful current and so minimize, if not absolutely remove, the quantity of smoke particles conveyed upward by the gases flowing from the combustion chamber.

A FEW minutes after midnight on the 1st inst. the Toronto Electric Street Railway Company inaugurated the new century by starting a new 1,600 horse power generator and a large engine to drive the street cars of the company. The generator is one of the best in the company's power house, and in a patriotic vein it has been christened the "Father O'Leary," in honor of the brave Catholic chaplain of the first Canadian contingent to South Africa which has recently returned to Canada.

MAJOR WALTER REED, surgeon in the United States Army, in a report to Major General Wood states that the Woolf system of sewage purification as carried on in Havana is inadequate as a disinfectant, and that chloride of lime would have given better results at less cost. This may possibly be the case in Havana, but electrozone certainly proved an excellent sterilizer at Brewsters, N. Y., and did much to render Riker's Island inoffensive.

MR. HART O. BERG, the European representative of the Electric Vehicle Company, is in America on a short trip. He says he believes every person of means in Paris will soon own at least one electric brougham, a victoria and a small gasoline-driven voiturette. Mr. Berg thinks the day of the large petroleum carriage is coming to an end, as the voiturette, holding from two to four persons and weighing from 900 to 1,200 pounds, is getting more and more popular.

BISHOP POTTER of New York was supposed to be suffering from gout for twenty-five years, but by the use of the X-ray it was discovered that he had been suffering from the inflammation of several small broken bones in his foot. The prelate has good reason to bless Prof. Roentgen.

BOTH Howard Abel, of Chicago, and Henry C. Davis, of New York, the agents of Charles T. Yerkes, are now installed in London, busily engaged in pushing the underground railroad work, which they hope to have in good shape by the time Mr. Yerkes arrives there in March.

THE Long Island Automobile Club will receive a magnificent gift in the course of the next six months in the form of a building to be used by the organization as a club-house. The club now has quarters at No. 552 State street, Brooklyn, and it is expected that it will move into the home to be given to it in May next.

A DISPATCH from Washington states that undue friendship for the Chesapeake and Potomac Telephone Company on the part of some members of the United States Senate is alleged by members of the Telephone Subscribers' Association who have for years been fighting for cheaper telephones in the District of Columbia. In the testimony in a suit brought to compel this company to reduce its rates in

compliance with a law of Congress it was developed that the company had twenty "dead-head" telephones. One of the attorneys for the telephone subscribers said no effort had been made to ascertain who had these "dead-head" telephones for the reason that "it was not believed to be politic to go into that question."

AN organization to be known as the Gas and Electric Fitters' National Association of America was formed in Chicago recently. Its promoters are confident it will strengthen the local union and decrease dissensions now existing between gasfitters and other trades.

CHLORATE of potash caused the explosions at Tarrant & Co.'s drug-house on Oct. 29 last, according to Prof. C. F. Chandler, the chemist, of Columbia University, who, at the request of Fire Marshal Seery, examined the testimony taken at the investigation into the origin of the fire. There were several tons of chlorate of potash stored on three or four floors of the building. In his report to Fire Commissioner Scannell the Fire Marshal gives it as his opinion that the fire was caused by the ignition of tar between the double floors. The loss by fire and explosions is estimated in the report at \$1,000,000.

A BOOT manufacturer in Switzerland is reported to have hit upon a novel means of improving the load factor of the plant which supplies electrical energy to his factory, says the "Electrical Engineer," London. This energy, it should be mentioned, is required principally for lighting purposes at night. With the exception of a comparatively small amount required for a motor load, most of the available power has hitherto been unutilized during the day, although a constant supply has to be maintained by the supply company, and paid for accordingly by the manufacturer. An arrangement has now been devised whereby it is proposed to remedy matters. Curiously enough, the idea was suggested by the abundant fruit harvest of the past season, and consists in no less novel an innovation than the artificial drying of fruit by means of heat generated by the surplus electrical energy. The apples are peeled, cored and sliced by machinery, the rings being thereupon consigned to electrically-heated ovens of the traveling type, wherein the evaporation may be regulated to a nicety. Judging from the success which seems to have attended the experiment it appears quite within the bounds of possibility that the method may find favor in such isolated cases where the local conditions are so eminently adapted.

A NEW variety of electric fire alarm has been produced in which no batteries are used. The system is intended for small towns and cities and is very thoroughly worked out. In each alarm box is a magneto machine, similar to that used in connection with the telephone as a call bell, which is connected with a powerful clock spring through appropriate cams and levers, so that when the box is operated by means of a key the armature of the magneto machine receives a definite succession of short, quick half turns. Each of these sends out over the circuit in which the box is connected an impulse of electrical current which may be of considerable power. This is received in the usual way on gongs and registers. To complete the system an ingenious line tester is used: normally, when everything is in proper order,

all the circuit is closed, but no current is flowing in it. If this circuit should be opened at any point, the boxes would not work, so the tester is used to send out, every two or three minutes, as may be desired, small impulses of current to ascertain the condition of the line. Its mechanism is very similar to that of the box. Upon the armature of a magneto machine is suspended a weight which is wound up by clock work and released at short intervals. This apparatus is connected into the line, and if everything is in good working order the resistance encountered by the armature of the magneto when the weight is freed causes the latter to descend slowly. Should, however, the circuit be open, the weight drops quickly and rings in an alarm for open line.

ON December 22, according to the London "Electrician," Prof. Slaby delivered a lecture in Berlin on multiple wireless telegraphy before the German Emperor and his suite and a distinguished audience. Prof. Slaby has been devoting his attention for a considerable time to devising a means of Hertzian signaling between several independent pairs of stations without the messages interfering with one another, and he has now apparently solved the difficulty. The method employed seems to be simple tuning. During the lecture Prof. Slaby signaled to two stations, one at Schönweide on the Upper Spree, 8 miles distant, and the other in the Professor's laboratory at the Charlottenburg Technical College, about 2½ miles distant. Messages were received from these two stations in the lecture-room simultaneously. For both sets of the receiving apparatus on the lecture table the lightning conductor on the chimney of the Schiffbauerdamm electric lighting station was utilized as an air-wire without removing its earth connection. The lecturer explained that the arrangements were such that the waves in the two cases were of an exactly predetermined length, and that the two sets of apparatus were each tuned to a different wave-length.

ACTING upon the invitation of the Central London Railway the Board of Trade has appointed a committee to consider the question of vibration caused by the working of the line, regarding which many householders along the route have made strong complaint. The committee will ascertain what alterations can be devised to remedy the trouble. American engineers consider the railway is using electric engines that are three times heavier than necessary to perform the work they are called upon to do.

A GOOD deal of progress has been made in Barcelona, Spain, and vicinity since last July, in completing electric roads already in process of construction, and in changing from horse and steam to electric traction. The Compañía Anónima, owned entirely in England, has completed, and is running its cars on a double track of about twenty-five miles through the principal streets of Barcelona. The chief constructors were an English firm, but the wire, tracks, electrical machinery, engines and motors all came from the United States. The same firm of contractors will also build, within a short time, a four-mile single track road in the same city. It is now operated by horses, and when electricity has been installed the line will be operated in conjunction with the other road. The contracts are all let for furnishing the eight-mile road from Barcelona to Horta, one-half of the line being ready for use. The only

hindrance to the sale of American electrical goods in Spain are the higher duties than on the same goods of other nations, but the difference in price is enough to give the preference to American goods.

A CABLE from England states that at a meeting of the London Underground Railway Company on January 7 it was voted to issue bonds for \$3,330,000 for the purpose of changing the motive power from steam to electricity. A shareholder asked the chairman of the meeting if an American syndicate was to do the work. The chairman replied: "Some Americans are putting in bids. We will select the best firms available."

ADVICES from abroad state that the work of constructing the telephone line which is to bring France and Italy into close unity is making great progress, the connections with Paris on the French side of the Alps having already been completed. Operations on the Italian side, however, are even more advanced, for the installation, which, for this particular part of the line, cost only one hundred million francs, has been made, and now the engineers are turning their attention to the erection of the line between Turin and Novi. After this it will be carried to Genoa, and thence along the littoral to the Italian capital. Paris and Rome, it is expected, will be in direct telephonic communication by March or April next.

IMPORTANT trials of submarine boats took place at Cherbourg, France, on January 7. The Minister of Marine, M. de Lanessan, and the Minister of War, Gen. André, went to Cherbourg specially to watch the experiments. After an examination of the submarine boat Morse, M. de Lanessan boarded the Narval and proceeded to the roadstead where a number of surface and submarine manoeuvres were carried out, Gen. André witnessing them from the Imprenable. The tests concerned new electric accumulators invented by a French naval lieutenant. The trials resulted satisfactorily.

A VERY large order of trolley wire is about to be shipped from Ansonia, Conn., to the far East. It consists of one million pounds of wire for a trolley road in India. A train of between fifteen and twenty cars will be needed to ship it to New York to be placed aboard a steamer.

ALUMINUM is, at the present price, the cheapest metal in the market, with the exception of iron, zinc and lead, says the "Electrical Review," London. This metal is now extensively used in place of copper, brass, tin, and in some cases even iron, especially when the reduction of dead weight is a question of great importance. Aluminum is also beginning to be very largely used in connection with electricity, as electrical conductors on this metal, giving the same conductance as copper, weigh only half as much, and cost less. It is impossible to foresee the ultimate extent of the use to which this metal can be put, but the progress made in aluminum during late years justifies the most sanguine expectations. Twenty years ago, the total output in the world did not exceed four or five tons, and its price was about \$30,000 per ton; ten years ago its price was reduced to about \$10,000 per ton, and the output increased to about 30 tons per annum; now the price is from about \$650 to \$700 per ton, and the output during the last twelve months is reckoned at 5,000 tons.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 9.

THE PRINCIPLE OF THE DYNAMO.

The action of the dynamo is a demonstration of the production of electrical action by magnetic induction. The induction coil is another example of the same law and by varying the flow of current in the primary the magnetic field is set in motion and will act upon the secondary winding or coil inducing electrical action in it. In the dynamo, however, the operation is just the reverse of that in the coil, for instead of putting the lines of force in motion and permitting them to act on a stationary coil, the lines of force remain stationary or constant and the coil of wire is put in motion.

By electric magnetism an intense magnetic field is secured and retained in which is rotated a coil of wire, which will by this means have induced in it electrical action so long as it is kept in motion within the field and cutting the lines of force.

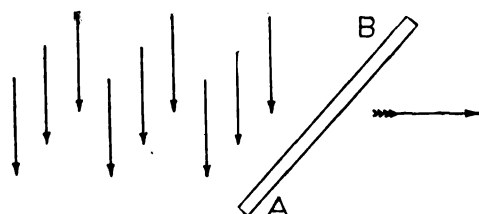


FIG. 1.

The first discoveries in this resulted in the construction of a machine in which a single coil of wire was rotated in a field of force created by a permanent magnet. This has developed with slight changes to the ordinary magneto, or sometimes called magneto generator, so common in general system telephone work to-day. The magneto led to the replacing of the permanent magnets by electro magnets to secure a more intense and greater field and also to a means for collecting the induced current by the use of a commutator so that the flow in the circuit would always be in the same direction.

When a wire is set in motion in a magnetic field so that it cuts the lines of force, the action will cause a difference of electrical pressure between the two ends of the wire. The direction and magnitude of the induced pressure depends upon certain relations existing.

The pressure depends upon the number of lines of force cut by the wire in a given period of time. It is given as a rule that when a wire cuts one hundred million lines of force in a second of time, the induced action will have a pressure of one volt, or if it cuts two hundred million lines in a second, the induced action will have a pressure of two volts and so on.

The number of lines of force that will be cut in a given period by a wire in motion in a magnetic field depends upon four items. First—Upon the strength of the field which means the intensity of the magnetic condition between two poles. Second—By the length of wire that is being acted upon by this magnetic field. Third—Upon the angle at which the wire

moves across the lines of force. Fourth—The speed with which the wire moves.

The direction of the induced electrical pressure depends upon two things. First, upon the direction of the lines of force in the magnetic field, and second, on the direction in which the wire cuts through them.

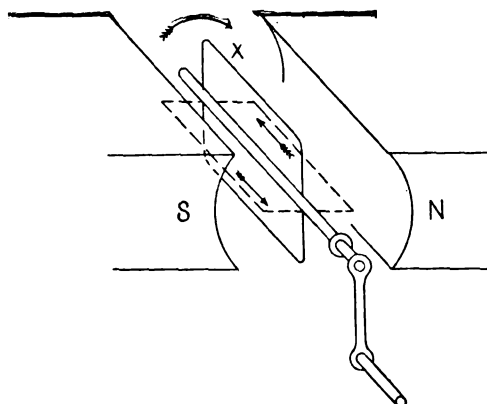


FIG. 2.

In Fig. 1, if the vertical arrows show the direction of the lines of force and the horizontal arrow indicates the direction in which the conductor A B is moved through the lines then the direction of the induced pressure in that conductor will be from A to B, that is, the end B of the moving wire will be positive and the other end negative. If the direction of the wire's motion is reversed, that is, it be moved through the lines in a direction opposite to that indicated by the horizontal arrows, the direction of the induced electrical pressure will be opposite to that first induced, thus showing that if the direction of the wire's motion be reversed, the direction of the current will also be reversed. Reversing the direction of the lines of force will also reverse the direction of the induced current.

There are numerous ways of remembering the direction of the induced current, the direction of the wires' motion, and the direction of the lines of force. A good way, however, is to hold out the right hand with the thumb sticking straight up, the first finger pointing out and the middle finger turned to the left and pointing at right angles to the first finger. Now if the hand be placed in such a position that the thumb will point in the direction the wire is moving, the first finger in the direction of the lines of force, then the middle finger will indicate the direction of the induced current in the wire.

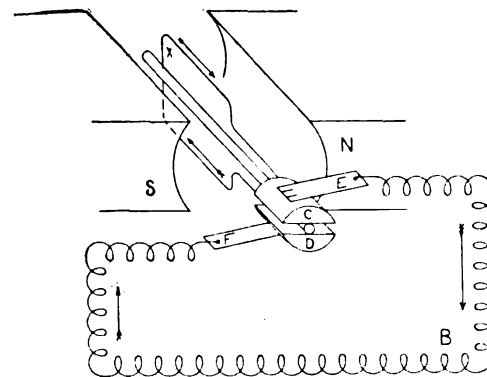


FIG. 3.

In Fig. 2, suppose N and S represent the two poles of a magnet and the wire X represents the conductor in motion within the field created by the magnet. The wire is represented as a complete circuit, rotating on a shaft, with one half of the circuit on each side of it. Then

if this be revolved in the direction of the arrow there will be induced electrical action in a different direction in each side of the circuit as indicated by the arrows on the dotted lines. You will also notice that the induced action must also change its direction in the wire in every half of a revolution.

To collect the current induced in this conductor an arrangement is used called a commutator and is shown in a simple way in Fig. 3.

You notice that the circuit B constitutes part of the entire circuit but is not in motion however. The current is collected by the brushes and while the plates C D revolve with the coil X, yet the brushes E and F remain stationary. As the coil is revolved the current changes its direction every half revolution, still the flow of current in the circuit B will always be in the same direction.

As was before stated electro-magnets are provided to secure a strong field of magnetism and the next point to take into consideration is the construction of one on that principle, and the laws governing it.

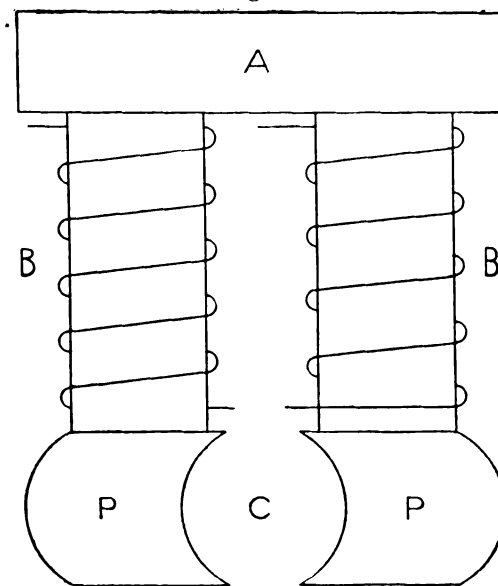


FIG. 4.

In Fig. 4 you will readily recognize a rather familiar type. Although made up of a number of parts of soft iron bolted together it is actually a horseshoe magnet, only not a permanent one, but dependent on the law of electro-magnetism for the magnetic field produced by it.

The names of the parts are as follows: B B are the "cores," A the "yoke" and P P the pole pieces. The space C is called the magnetic field; this is where the magnetism is the strongest and where the coils, called the armature, are revolved.

Coils of insulated wire are wound on the cores and the strength of magnetism secured will depend entirely on the number of turns of wire wound on the coils and the amount of current flowing through the wire. This is reckoned by ampere turns and is generally called ampere turns of magnetic condition. To calculate this multiply the number of turns of wire, that is, the number of times the wire is wound around the iron, by the amount of current flowing and this will give the ampere turns.

One ampere turn is one ampere flowing once around or its equivalent; for example, one half an ampere flowing twice around would be one ampere turn or one-quarter of an ampere flowing four times around would be one am-

pere turn and four amperes twice around would be eight ampere turns, etc.

The magnetism secured may be called magneto motive force or magnetic pressure, terms which are similar to electromotive force or electrical pressure.

The number of lines of force in any magnetic circuit is equal to the magnetic pressure divided by the reluctance of the circuit. It can be shown mathematically that the magnetic pressure in a complete magnetic circuit is equal to the number of ampere turns multiplied by a constant, which is practically 1.

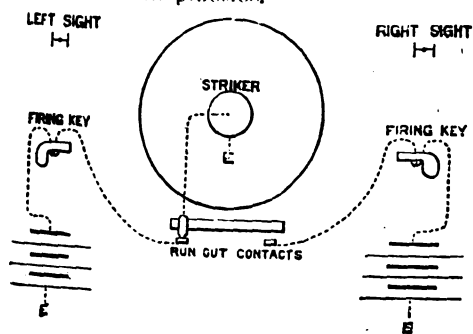
In order that the strongest possible magnetism will be produced in a magnetic circuit it is essential to have the circuit made up as far as possible of material having the highest permeability, which is soft iron, and to arrange as many ampere turns as possible to set up the magnetism.

Article No. 10 will treat of this same subject.

NAVAL GUN CIRCUITS.

The advantages that are obtained by using electricity for firing guns in the navy are twofold, says the "Electrical Review," London. First and foremost is the increased safety; for with its electric circuit broken until the gun is run out, a gun can only be fired in a safe position, and the fuse, or tube as it is called, containing no fulminate of mercury, allows of rough handling of the cartridge, which under the circumstances that attend a rapid and continual fire is inevitable, or practically so. The second advantage is in the position of the captain of the gun, who can keep his eye along the sights and his finger on the trigger the whole time the gun is being loaded, so that he is ready to lose no time directly the gun is out again.

In percussion firing, which is always an alternative in case of the electric circuit failing, the lanyard that releases the striker is not in the hands of the captain of the gun himself, it is pulled by a subordinate on the word "Fire!" When the movement of the ship is considered, together with the motion of the target, the fraction of time that elapses between the word of command and its execution makes no small difference to the practice.

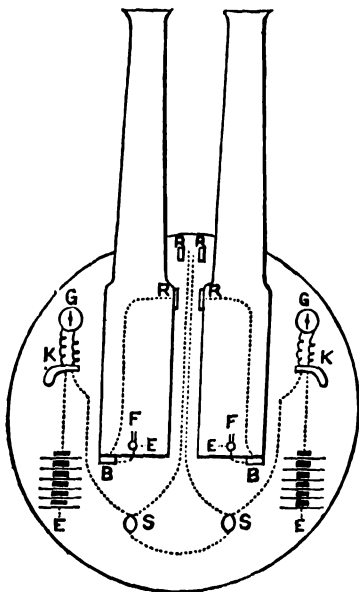


6-INCH Q.F. GUN CIRCUITS.

A reference to the accompanying diagram will show how the circuit is arranged in the 6 inch quick-firing gun. The sights are fixed on the mounting, and not on the gun itself, which, by its recoil, would otherwise force the captain of the gun to take a fresh alignment each round. There are two sets of sights, one on either side, two batteries, and naturally two distinct firing keys, which are in the form of a pistol, the trigger making contact on being pressed.

The circuit in each case may be traced from the negative pole of the battery through the

firing key to a rubbing contact at the outer extremity of the recoil slide; a contact piece on the gun itself takes against this when the gun is fully run out, and only then is the circuit complete to the striker. The striker, so called from the fact that it is made to do duty as such when percussion fire is resorted to, consists of a steel tube filled with gutta-percha insulation, through the center of which runs the circuit, ending in a brass nipple, which takes against the contact piece on the fuse itself when the breech is closed. A mechanical device on the breech prevents this nipple from making contact until the breech-piece is properly home, so that it would be impossible to fire the gun with the breech only partially in position. The nipple makes contact with a small disk that is well insulated from the brass cartridge into which the fuse is screwed, and the circuit proceeds from this disk to a thin platinum bridge embedded in priming composition and thence to earth, which is represented by the brass cartridge case and the gun. The positive pole of the battery being brought to the gun mount-



TURRET CIRCUITS, 12-INCH R.L. GUNS.

ing picks up the return through the gun. Now, it will be seen that no dangerous premature explosion can take place, even through the greatest carelessness. In the excitement attendant on gun practice, details of the drill-book are sometimes overlooked, and however well trained a man may be, he is not infallible, as the occasional accidents that have occurred in times past go to show.

It may be argued that mechanical means can be provided to prevent the striker from being released, in the case of percussion firing until the gun is in a safe condition, and that electric circuits have the disadvantage of giving out on small provocation; this is true, but hitherto it has been found very hard to devise a percussion lock that will withstand sufficient wear and tear to be absolutely reliable. With electricity, if there is a failure it is on the safe side, for it simply results in the gun not going off at all.

The turret or barbette circuits in battleships of the later types, such, for instance, as the *Majestic* class, serve as a very good illustration of the precautionary measures that are provided to insure against accidental firing of the gun when in an unsafe position, or before the breech is properly closed.

The safety arrangements may be divided into four, namely, the firing key, the rear switch,

the run-out contact and the breech-locking bolt. If we trace the circuit in the accompanying diagram, we shall see that it is in duplicate, one battery being placed on each side of the turret, and the connections between each battery and its individual gun exactly similar. Thus, in either case we start from the negative pole of the battery and come first to the firing key. This key or pistol is represented in the figure at K and it is placed in the sighting hood from which the captain of the gun lays his sights.

The circuit is seen to continue from K to the rear switch S.

The rear switch has two duties to fulfill, the most important being the safety it provides for the man whose duty it is to place the fuse or tube in the gun. If this switch is at "off" it is obvious that the tube cannot be fired while the man is immediately in rear of it, and thus cause, by the recoil of the gun, the death of the man attending the breech mechanism; it is under his control, and he only puts it to "on" when he is in a safe position immediately before the gun is reported ready.

From this switch the circuit proceeds to R, the run-out contact. This contact is made by the gun itself, automatically, upon reaching the limit of its run-out position, so that in case of the gun not being properly run out to its full extent it will be impossible to fire it. Were this safety arrangement not there, the gun might be fired when only half out. Its recoil would then be only partially absorbed by the hydraulic cylinders, and disastrous consequences might ensue; in any case there would be a heavy strain brought upon the mounting. From this contact we now come to the fourth and last safety arrangement, which is the breech-locking bolt B.

The breech-locking bolt provides against the gun being fired when the breech is not properly closed, and in order to explain its action it will be necessary first to examine the means by which the breech is screwed home.

After the gun has been loaded, a cradle, in which rests the breech piece, is moved over by a hydraulic ram until it is opposite the chamber. A second ram then pushes it from the rear into the gun.

So far the breech piece is not locked in any way, and it is not until the gun begins to run out that a projection on the breech piece, taking in an inclined slot on the carriage, forces it to revolve within the chamber and the screw threads to take. Until the breech has performed nearly a quarter of a turn, it is not properly home and the gun is not safe. To provide against the possibility of the gun being fired without the breech being properly and securely closed, the fourth safety device is designed. It consists of a locking bolt which works on an inclined plane as the gun runs out, and the circuit is passed through this bolt, insulated from it, of course, so that when the bolt locks the breech piece to the gun the fact of its coming into position completes the circuit.

The circuit proceeds then from the locking bolt direct through the contact piece on the gun tube, thence through the fine fusible bridge embedded in priming composition, and thence to the brass body of the gun tube, where it picks up an earth return in the metal of the gun itself; the positive pole of the battery being led to earth.

With the circuit as at present described, it will be seen how either battery may be made to fire its own particular gun. But in practice it

is often necessary to fire both guns simultaneously.

The captain of the barbette or turret usually takes up his position in one of the sighting hoods, and lays both guns from that position—it would cause waste of valuable time if he had to change his position for each gun—and so the two circuits are connected together by a wire between the two switches S. It will now be seen that either battery may be made to fire the guns singly, or both guns simultaneously, according to the connection made by the switch at S, so that if either battery fails the other may be substituted.

A vertical galvanometer, offering a resistance of 1,000 ohms, can be switched into the circuit in place of the firing key immediately before the gun is fired, and this will show if the circuit is complete. Its high resistance renders the current too small to fire the fuse, and thus the circuit may be tested when the gun is loaded.

THE DEVELOPMENT OF THE DENSITY FACTOR.*

BY C. TURNBULL,
Borough Electrical Engineer, Tynemouth.

The density factor of an electricity works may be defined as the number of 8 cp. lamps connected per £1 worth of mains laid, or perhaps better as the number of units sold per annum per £1 worth of mains laid. Mains in this case should include transformers and the like. Owing to the great cost of every yard of cable laid, it is of the utmost importance to have a good density factor. Indeed, it may be said, take care of the density factor—i. e., get the main loaded up with every kind of consumer within reach—and the load factor will take care of itself. The density factors of the following towns, taken quite at random from "Garcke's Manual," will serve to show the great differences that exist:

	8 cp. lamps connected per £1 worth of mains.	Number of units sold per annum per £1 worth of mains.
Aberdeen.....	1.21	7.8
Brighton.....	1.03	25.4
Derby.....	.89	17.5
Edinburgh.....	1.12	30.6
Harrow.....	.64	6.5
Manchester.....	.94	18.8

The cost of transformers has not been taken into consideration in the above, as it is not shown separately in the manual. Seeing that mains represent some 40 to 50 per cent. of the capital expenditure, I think the figures are worthy of consideration.

Rented Wiring.—To meet those who do not wish to be at the expense of wiring their premises, it has been proposed to take the mains throughout the building instead of stopping at the meter only, and to charge more for the current consumed to cover the extra cost. This method is not entirely satisfactory, especially seeing that the modern tendency is to make consumers pay a fixed sum per annum to cover standing charges, with a comparatively small charge for current used. I would suggest that the following points are desirable in a system of rented wiring: For a plain fitting, including lamp and switch complete, a fixed quarterly rental should be charged. Additional fittings on the same switch should be charged at a second and lower rate. Additional lamps on a fitting not having independent switches should be charged at a third and still lower rate. The

*Paper read before the Newcastle Section of the Institution of Electrical Engineers. From the "Electrical Engineer," London.

hirer should have the option of hire purchasing the installation at rates based on the rentals, or he should be allowed to purchase outright at any time for a reasonable sum. When the station does the wiring, the rentals, etc., may be settled by an examination of the average costs of installation, but, personally, I prefer to have the wiring done by a wiring firm, as it needs more supervision than most of resident engineers are prepared to give. Besides, with smaller stations at any rate, there will not be a sufficient flow of work to keep an efficient staff busy, unless outside firms were discouraged, which would be foolish. When the wiring is done by contract, the terms must be settled by bargain. In Tynemouth we have arranged with a private firm to do the wiring, we to collect their rentals. A plain fitting costs 5d. per quarter, or a fitting without a separate switch 4d. per quarter; while an additional

lights is switched on, another lot will be switched off. In many cases people will only wire a few rooms in their houses to make sure that they will not at any time be let in for a big bill. It has been proposed to meet the difficulty by having two meters—one to register during the hours of heavy load, and the other during the hours of light load—the units registered on the latter being charged at a lower rate. On examination this will be found unsatisfactory, for a shop which, say, averages two hours a day throughout the year will be charged at the high rate although undoubtedly a good customer, while an office which occasionally overlaps the station maximum demand and takes current only during the winter months will get off at far too light a rate. I would suggest to you that houses which have a good steady load throughout the year will not appreciably increase the station maximum de-

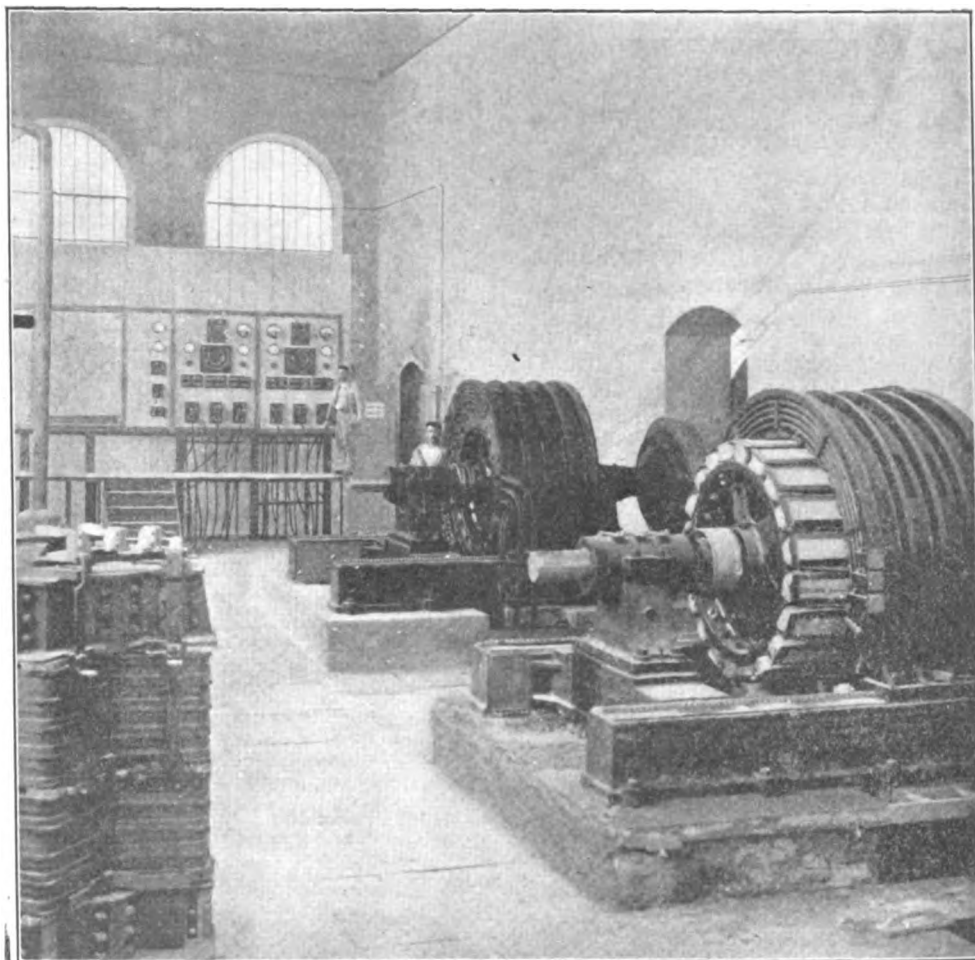


FIG. 6.—TRIPHASE LABOUR ALTERNATORS AT ENIGNS, FRANCE.

lamp on a fitting is 3d. per quarter. Double these rates will pay off the cost in 4½ years, or 1½ times the rates will pay it off in 6½ years, or the hirer may buy at any time at a moderate price. Of course these terms are not suitable for large houses, and in many towns special arrangements would have to be made to meet special cases; but it is to be observed that rented wiring is intended mainly for small consumers.

The Two-meter System.—It has always been a trouble with the maximum demand system that consumers are in fear that their accounts will go up with a jerk if they happen to put on two or three extra lights some night. This has been met in various ways, such as by allowing the demand indicator to be short-circuited on special occasions, or by having two-way switches arranged so that if one lot of

mand by having bedroom and other short-hour lights connected up in addition to their long-hour lamps, nor will they require any heavier mains. It is therefore worth while to do something to rid their occupiers of the fear of a largely increased maximum demand if these occasional lamps are connected up. This can be done by allowing consumers to have two meters, one for the long-hour lights and the other for the remainder. The units registered by each meter are charged as if for a separate consumer, so that practically the full rebate is obtained on the long-hour lights and none on the occasionally used ones. A small extra rent is charged for the second meter, which may generally be of the cheap kind now coming into use. It is also often possible to omit demand indicator, as, of course, the demand on each meter is the full number of lamps con-

nected thereto. This concession has the effect of relieving people from anxiety, so that they wire their houses freely, and I doubt not they will use their light freely too.

III.—HIGH TENSION POWER TRANSMISSION PLANTS IN FRANCE.

BY FRANK C. PERKINS.

Engins-Grenoble Polyphase Power Plant.

Among the many power transmission plants in France none are of more interest than that introduced by the Société L'Eclairage Electrique of Paris and supplying current to Grenoble and Voiron from the power house located at Engins, France. The enormous potential used on this transmission line is of itself enough to interest any engineer in this installation. This

single static transformer is somewhat different from the usual American practice, where three separate single phase transformers are used, the connections being so arranged that they may be connected up "star" or "delta" as desired for three phase operation. This is particularly the case when large transformers are used in America for power transmission work, and usually when rotary converters are found necessary, three separate single phase transformers are supplied for each rotary converter. Not only do the French engineers favor the single three-phase transformer, but the German manufacturers also build them extensively and claim for them a greater output for the same amount of iron, and a less core loss.

Two low tension alternators of the tri-phase type are each directly connected (Fig. 6) to a turbine of 500 horse power capacity in the adjacent room. The stationary armature of the

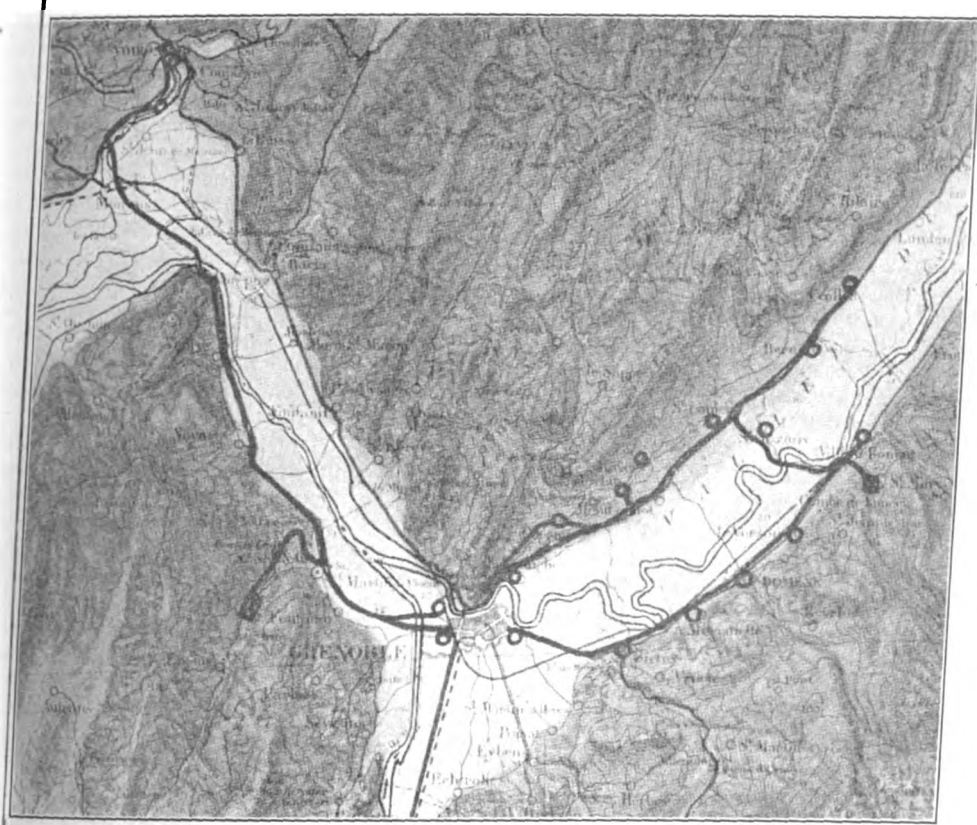


FIG. 7.—HIGH TENSION POWER TRANSMISSION LINES IN FRANCE.

power and lighting circuit (Fig. 7) supplies not only the current to light Grenoble, and Voiron but also other places along the route of 40 kilometers, notably at Massinage. The potential used on this line is 15,000 volts. The distance from the power house at Engins to Grenoble is 10 kilometers, while the line running to Voiron is more than 30 kilometers long. The power house is built of masonry and is divided into two parts, a turbine room and a generator and transformer room.

The alternators, Fig. 6, were designed by M. Labour and are of the three-phase type having stationary armatures and revolving fields. The voltage of the generators is raised to 15,000 by triangular step-up transformers of the type shown at the left in the illustration. The foreign practice in transformer building is to use three cores and three sets of primary and secondary coils placed over these cores and held in place by an upper and a lower yoke, which completes the magnetic circuit. This method of transforming the three-phase currents in a

alternator is so constructed that it can be moved along the base at the will of the engineer, leaving the revolving field exposed, and when desired repairs can be made with great convenience. The output of each machine is 375 kilowatts and the plants supply not only current for lighting purposes but also for operating a number of motors varying in size from $\frac{1}{2}$ horse power to 100 horse power.

The next power transmission plant to be considered is that located in the Valley of Gresivanden at Lancey, France. This plant supplies current for lighting 35 different villages in this valley, as well as power for small motors in the various factories. The next issue of *ELECTRICITY* will contain an exterior view in one of the villages with its pole line construction and transformer for supplying the lights in the neighborhood. An interior view will also be given of the low tension alternator and turbine. This was one of the first plants in France to be operated with a 12,000 volt transmission line.

THE ELECTRIC ACCUMULATOR.*

BY H. C. SCHAEFER.

From the earliest days it has been attempted to store up energy of various kinds for use at a later period, as, for instance, the storage of water and gas in large tanks for use at periods of demand. Thus between 1850 and 1860, when electricity was first coming into use commercially, it was attempted to store up this kind of energy also. Of course they did not accomplish very much at that time, but, as everyone knows, the first experiments often lead to great results later on. In 1854 Mr. Sinsteden, in experimenting along this line, found that by sending an electric current for a certain time through two lead plates, which were immersed in a vessel containing dilute sulphuric acid, the plates themselves became able to deliver current for a short time after the supplying circuit was removed. He also found that this secondary current flowed in an opposite direction to the primary current. As he did not realize the importance of this discovery at the time he dropped the matter altogether. In 1860 a Frenchman, Gaston Planté, tried on the basis of the former experiment to construct a secondary cell for telegraphic work, but as he could not obtain sufficient capacity, he also allowed the matter to drop. In those days the commercial value of secondary cells was not appreciated. For several years nothing further was heard of the matter until electricity began to be largely used on a commercial scale, then the necessity for a secondary battery began to be apparent, and many inventors started work along this line. Planté, among them, attempted to develop the accumulator, and in 1879 published the results of his experiments, and also the method of making a durable cell.

At this point, let us see how the lead plates and the acid behave when an electric current is passed through the cell; in other words, what chemical action takes place under this condition. Let us examine the action in a formed, but discharged cell. This has in this condition on each plate a chemical combination of lead oxide and sulphuric acid called lead sulphate. Now, in sending a current through the cell, or in "charging," as we call it, a part of the water in the acid is disintegrated into its elements—oxygen and hydrogen—the oxygen passes to the positive plate, and uniting with the lead sulphate forms a higher lead oxide called lead peroxide. The sulphur and part of the oxygen which was contained in the lead sulphate is recombined with the acid in the cell. The plate in this condition has a dark-brownish color. The hydrogen which is freed by the decomposition of the water passes to the negative plate and combines with the oxide of lead, forming sulphuric acid, which also goes into the solution. The active material is left on the plate in the form of spongy, porous, metallic lead. This plate will have a bluish-gray color when fully charged. From this it can be clearly understood that in charging the acid density or specific gravity will always increase, provided the acid is free from impurities. If the acid is not chemically pure actions other than those described will take place, seriously interfering with the action of the battery, as well as decreasing its efficiency. This shows that it is

*Paper read before the Electrical Association of New South Wales, England.

absolutely essential that the acid for electric accumulators should be absolutely pure, otherwise satisfactory results cannot be obtained. Now, when the lead oxide on the plates has all been formed into peroxide and spongy lead the current can no longer do any storage work. The oxygen and hydrogen escape freely from the positive and negative plates, forming on the surface of the acid a mixture of the gases called oxyhydrogen, which, when lighted, will burn with an explosion, forming water again. When this free escape of the gases takes place the acid density will no longer increase, and the battery is fully charged. In discharging the cell we know that the current will flow in the opposite direction. We will now see what chemical actions take place under this direction of current. The oxygen this time, instead of going to the positive plate, passes to the negative and unites with the spongy lead, forming lead oxide, which, combining with the sulphuric acid out of the solution, deposits lead sulphate. The hydrogen this time passes to the positive plate, and, combining with one part of the oxygen of the lead peroxide, forms water, which passes to the solution. On this plate, also, the sulphuric acid combines with the lead oxide and forms sulphate of lead. We can now see that in discharging a cell the acid density or specific gravity decreases, as in charging acid is formed; in discharging it is disintegrated. We have now the same condition in the cell as we had before charging. The longer we leave the battery uncharged the more sulphate of lead will be formed and the lower will fall the density of the acids in the cells, and eventually such a deposit of the sulphate of lead would be formed on the plates as to absolutely ruin them. This teaches us never to give a battery too long a rest when it is discharged. It is always wise to charge a battery as soon as possible after it has been discharged. Planté, in making his plates, did not fill them with paste at all, but, by sending a low current through them, formed peroxide of lead on one plate and spongy lead on the other out of the metallic lead of the plates themselves. He soon found that in sending a current through them in one direction the formed material increased very slowly and remained in a very thin layer over the surface; in fact, it would reach only a certain thickness before it ceased to increase at all, whether the current was kept flowing or not. He, therefore, found that, in order to get a greater capacity, he must look for some other method of increasing the amount of active material. This action is analogous with the oxidization of the various metals by the moisture of the atmosphere. As, for instance, iron, copper, lead, zinc, and so forth, when exposed to damp atmosphere, form a certain amount of oxide on their surfaces. After a certain point this oxidization will not increase—the inner part being protected by the coat of oxide already formed; this action is nearly the same as with the accumulator plates when trying to form them as Planté first did.

In forming the accumulator plate it is necessary to get as much active surface as possible without actually destroying the strength of the plate itself. The greater the amount of active surface the greater the capacity of the accumulator will be. Planté, after further experiments, found that by frequently changing the direction of the current through the plates, he could enormously increase the effect on both plates, and that the plates so formed

had a very good capacity and a long life. In this way Planté was very successful in building up a good durable accumulator, but, as it took a prohibitively long time to give his cells even a fair capacity, it never attained a commercial success, the cost of forming being entirely too great. To reduce the time required for forming and attendant cost of manufacture, Mr. Faure, instead of forming active material out of the plates themselves, gave them a coating of lead oxide, or, in other words, he "pasted" them, as we now call it. By this means it was found that the time for forming could be reduced to a period covering several days only instead of years. An accumulator thus made showed a very good capacity, but the paste, while adhering very well to the negative plate, would not remain on the positive. In a very short time it would loosen from the positive plate, falling down and greatly reducing the capacity. As the ordinary charging current was too high to properly form peroxide it rotted the plates instead of forming them; the peroxide forming too rapidly would scale off in chips, leaving the clean lead for further forming, thus in a short time destroying the plate entirely without obtaining an active surface. This cell, as well as Planté's, was not a commercial success. At this time things did not look very bright for the success of the electric accumulator, but a better one was about to be evolved by a Mr. Tudor of Rosport at Luxemburg.

Before we see how he accomplished this, let us ascertain why the active material made according to the Planté method remained in such close affiliation with the plate itself, and why that formed after Mr. Faure's method did not. The negative plate is not subject to disintegration as is the positive, for the following reasons, and may, therefore, be left out of the question. Spongy lead, electrolytically formed from lead or lead oxide, is so porous that it leaves room for the lead sulphate to settle, without forcing it apart or without injuring its contact with the plate itself. In other words, the spongy lead is so amalgamated with the lead itself that the expansion due to deposition of lead sulphate is not sufficient to cause it to fall off. It therefore follows that the great difficulty has been to find a method to properly form the positive plate. Mr. Faure did not succeed because he could not give the active material enough hold on the grid of lead to prevent it from falling off. By the Planté method of formation, not only the external surface, but the surface of the fine pores of the lead as well, was formed into peroxide, and as the peroxide is larger in volume than the lead itself, it formed a very secure connection with the grid of plate. The more peroxide that is formed the more these pores will be enlarged, and the more acid and oxygen will find its way to the active material and inner parts of the plate, tending still further to form peroxide, which is thoroughly amalgamated with the surface of the lead plate. This action will continue for a certain time, the peroxide penetrating deeper and deeper, until the acid ceases to reach the metallic lead under a given current density. The formation may then be called complete. This action is carried on until as much active material is obtained as possible without destroying the strength of the grid itself. It can now be said that the capacity of the battery will depend upon the amount of surface the plate presents to this action, the best battery being the one which will present

the most active surface for a given weight of lead without weakening the structure of the lead. Faure, as previously stated, pasted his plates before forming them. In forming the lead oxide paste was formed into peroxide, which occupies a larger volume than lead, and as there is no good contact between the plate and peroxide the latter soon scales off and the capacity drops. As the charging current is too strong to form a thin sheet of peroxide this eventually leads to the entire destruction of the positive plate. The action is the same in all plates made in this manner; that is, in all pasted positive plates the falling off of the active material will sooner or later entirely destroy the battery, the difference in expansion between lead peroxide and lead sulphate requiring a very strong contact with the metallic plate.

Mr. Tudor, in studying the accumulator question, considered deeply the two methods—that of Planté and that of Faure. By carefully analyzing the reasons for their failure, he succeeded in bringing out the first battery of the well-known "Tudor" type, which battery, when finished, he installed in his residence at Rosport in 1882, where it has been in satisfactory operation ever since. And now let us investigate his method of producing the first good commercial plate. He did this simply by combining the Faure and Planté systems. After charging his plates for a certain period, say three to four months, as Planté did, he obtained a very fair cast of peroxide, not only on the lead surface, but penetrating somewhat into the plate, as described before, and pasting them afterwards, he had a rough porous surface for the paste to adhere to, and in forming the plates a second time to oxidize this paste higher he found that the two separate coats adhered together very satisfactorily. He found afterward, however, that no matter how thorough the mixture seemed to be, after a period of, say, one to two years, the pasted part fell out of the positive plates, but, as the current could not find more metallic lead when the paste had fallen away, the plate could not be injured, and that by this time the Planté formation had increased to such an extent that, in spite of having lost all the peroxide formed from the paste, it still retained its full capacity. In fact, we might now say he had obtained a perfected Planté plate. From this period the Tudor accumulator takes the lead as a satisfactory working battery.

In 1887 the "A. F. A." Company undertook the manufacture of the Tudor plate or accumulator for Germany, and from that time, year by year, there has been a steady improvement in the construction and formation of the plates, until this type of battery has reached its present high state of perfection. Many difficulties had to be encountered and overcome, not only in the plates themselves, but in the method of manufacture, in order to cheapen the cost of production. Electric accumulators are used far more largely in Germany than in any other country in the world. The annual production amounts to over £900,000 per annum.

It is interesting to note that between 1895 and 1897 a very big increase in the output of batteries took place. This was due to the perfection of the new, large surface plate at that time, improving the batteries so much that a large gain was effected in the sales. They succeeded in finding a method of forming the Planté plate in a very short time,

bringing its cost of manufacture down to a reasonable point. This was due to several years of hard investigation and experiment by the "A. F. A." Company. This plate is the one at present in use, and, without doubt, is the most perfect positive plate on the market. It may be of interest here to inform you that Dr. Nansen, on his Arctic exploration trip, took one of these batteries with him for lighting his ship, the Fram, and brought it back after three years' service in perfect order. This type of cell has been produced with capacities varying from 12 ampere hours to 25,000 ampere hours in one hour. Each individual plate of the latter has a capacity of 1,250 amperes. I may state here that a new method of soldering has just been introduced, by means of compressed gases, which reduces the cost and time required for soldering to about one-half of what it was formerly. I may mention a large order which we recently supplied in Berlin, consisting of seven batteries, each battery containing 280 cells, with an output of 5,328 amperes each for one hour. These batteries are connected up in parallel on the three-wire system, 140 cells in each row, making the output altogether for each 10,656 amperes per hour. Each cell of this big battery contains 165 gallons of acid. These batteries are giving the very best results.

The demand for electric accumulators is rapidly increasing, and up to the present time the "A. F. A." Company have sold over 12,000 batteries and are casting over 40 tons of lead per day. They make a special feature of the care and maintenance of the batteries after erection, and in this way obtain excellent results, which are certified to by testimonials from all parts of the world. From my preceding description of the chemical actions taking place within the battery it can be seen that the life and cost of maintenance depends almost entirely upon the care exercised in the operation of the battery. If the battery is worked within its rated capacity and clean, pure water and acid are used for filling the cells the results will be very favorable and the cost of maintenance low. If, on the other hand, the battery charge and discharge is carried to a point beyond that for which the particular size of plate is intended the life of the battery will be greatly decreased as the abnormal chemical actions taking place will quickly ruin the formation of the plates, causing rapid disintegration of the active materials. I cannot emphasize this fact too much, as a storage battery is not like a dynamo which will stand overload, limited only by the heating effect. It should be worked within the capacity for which it was intended. The instructions issued for the operation of these batteries by the manufacturing company are so simple that there should be no difficulty for an ordinary workman to care for the battery in such a manner as to give the best results. It is always well to inspect a battery regularly, say a few cells each day, in order to keep all in a uniform condition, rather than to wait for any trouble to make itself manifest in the working of the battery. In this way the time and expense of maintenance is reduced to a minimum.

San Juan's First Trolley Road.

Last week in San Juan de Porto Rico thousands of persons witnessed the starting of the new trolley system, the island's first road of that description.

An Isolated Residence Lighting Plant.

The use of electricity for lighting residences is extending rapidly of late years. Not only is this true, but the character of the electric installations for this purpose has improved steadily, until at present the equipments in some of our homes leave little to be desired in the way of perfection of design and installation.

To this class belongs the plant now operated by Mr. Archibald Rogers for light and power at his country home, situated at Hyde Park on the Hudson.

Electricity is used in this case, not only for the 400 lights in the residence and stable, but also for power, five motors ranging from $\frac{1}{2}$ to 2 hp. being used, some to pump water and others to operate tools in the machine shop.

The generator made use of is a shunt-wound machine of 200 amperes capacity, with a range in voltage from 100 to 150. This variation in voltage is required to charge the battery, since no booster is used. The generator is direct connected to a horizontal engine of 60 hp. capacity and 300 r.p.m. Steam is supplied from three horizontal return tubular boilers of 50 hp. each. These boilers also supply heat for the premises and steam for the laundry. A white Italian marble switchboard contains all instruments and switches necessary to operate the generator, battery and feeders.

The battery room and layout is one of the most perfect that has been constructed. It is built of stone to a distance of four or five feet above the ground, and from this point the walls are of heavy double frame construction. The numerous windows are connected to an iron rod, by means of which all can be opened simultaneously to permit of ventilation. The floor is of heavy stone flagging with Portland cement joints. In one corner is a drain leading into a 3" tile pipe.

The battery consists of 55 "Chloride Accumulator" cells of the Electric Storage Battery Company's type G-15, having a capacity of 1,200 ampere-hours at the normal rate. Each cell is composed of fifteen plates approximately 15 $\frac{1}{2}$ " square, suspended in lead-lined wooden tanks. The tanks are supported by glass insulators which rest upon wood stringers. These stringers are raised about six inches from the floor by wood supports spaced 40 inches. By this construction the battery is placed in one tier and is thus easily accessible. The aisles between rows are ample. The floor space occupied is 20x40'. The wiring to the battery terminals and end cells proceeds from the engine room in a 6" tile pipe, each wire being protected by a circular loom. In the battery room all the wire is run open upon porcelain insulators.

The switchboard is so arranged that the generator can supply light and power at the same time that it is charging the battery. When this is being done the pressure at the lights is kept at the normal 100 volts by cutting back on the battery by means of an end cell switch. When charged the battery can be used alone to supply light and power, or it can be thrown in parallel with the generator to assist it during hours of extreme load.

In this plant the storage battery has had a most complete test, extending over a long term of years. The operation of this plant is rendered most simple by the introduction of the battery. To charge each day it is necessary to run the engine from 7 A.M. to 12 M. only, and during the remaining nineteen hours the battery is discharged to supply lights and

power. The great advantage of such an arrangement in a residence cannot be overestimated, for it renders it possible to obtain light at any time of day or night without the necessity of running the engine plant more than five or six hours. Moreover, the period for operating the engine can be selected at a time most convenient to the man in charge. In truth, these facts are of such value that a battery in such cases is considered almost a necessity, and, as a result, there are but few plants being installed in residences without this auxiliary.

The Babcock & Wilcox Company's New Works.

With the beginning of the new century work was started in the new boiler works of the Babcock & Wilcox Company at Bayonne, N. J.

The engine was started at midnight, at the dawn of the new year, in the presence of the Mayor of Bayonne and a number of the city officials and the officers and heads of departments of the Babcock & Wilcox Company.

Operatives went to work at once in the drum shop, which is the first department to be put in operation, and in the presence of the guests a steam drum was completed out of the flat sheets. Those present witnessed all the operations of shearing, punching, rolling, riveting and assembling involved in its manufacture.

Supper was served to the guests and toasts were drunk to the success of the new plant.

The new works of the Babcock & Wilcox Company are located in Bayonne, where the company has purchased thirty acres of land, having a frontage of 650 feet on the Kill von Kull, with a depth of water 25 feet on the pier line.

The plant is the largest of its kind in the world. The buildings completed have a floor area of about 160,000 square feet, to which will be added at once buildings of approximately 40,000 square feet floor area.

The plant is equipped throughout with special tools, and has been designed with the greatest care to expedite the processes of manufacture by reducing to the last degree the needless handling of material and by the use of the most approved appliances.

The business of the Babcock & Wilcox Company is over thirty years established, beginning with the partnership existing between Babcock & Wilcox in the manufacture of engines in the early sixties. The first boilers were built by them in 1867. The partnership was changed in 1881 to the present corporation.

The works of the company have hitherto been located on grounds leased from the Singer Manufacturing Company in Elizabethport, N. J., but the enormous growth of the business in later years made necessary an increase in productive capacity and in 1899 the company decided to build the new works now nearing completion.

The site chosen is an ideal one. So large a tract of land with so desirable a water frontage close to New York City is exceedingly difficult to obtain, and in most instances such a manufacturing site can only be obtained by filling in soft marshes fronting on the water. The site occupied by the Babcock & Wilcox Company is remarkable in that it consists wholly of solid ground, no piling having been used for either the buildings or the heavy foundations required for the machinery installed.

A spur track from the Central Railroad of

New Jersey enters the property, so that the company enjoys the best of facilities for shipping both by rail and water.

The famous water-tube boilers manufactured by the Babcock & Wilcox Company have a world-wide reputation. The success of the water tube boiler dates from the first boilers of their manufacture. In addition to the enormous business which they are doing in stationary boilers the company have in the last few years entered into the manufacture of marine water tube boilers which are now extensively used in the United States Navy, are being introduced in the British Navy, and are very widely used in the merchant marine.

CANADIAN NOTES.

(From our Ottawa Correspondent.)

The New Westminster & Burrard Telephone Company of British Columbia, is looking into the question of establishing telephonic communication between Victoria and Nanaimo, B. C.

Mr. Geo. H. Collins, of Greenwood, B. C., has sold to Nelson capitalists all his interests in the Greenwood & Phoenix Tramway and the Phoenix Electric Light Company. The new owners purpose commencing operations in the spring on the tramway which is to connect Greenwood with Phoenix.

The council for the town of Lindsay, Ont., has approved of the submission to the ratepayers of the town, of a by-law authorizing the corporation to operate a municipal street lighting plant.

Messrs. Ely and Turner, of Warton, Ont., propose installing an electric light plant in that town, and have asked permission from the municipal authorities to erect poles and wires on the streets.

Mr. C. H. Mitchell, of Niagara Falls, Ont., has made an inspection of the source of power at the falls, for the waterworks, and at the power house of the International Traction Company with a view of devising some means of increasing the water power and preventing ice blockades. Two plans are favored, one to enlarge the intake and the other to build a submerged dam.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended January 2:

Amsterdam, 3 cases, \$176; Antwerp, 155 packages, \$13,576; Argentine Republic, 158 packages, \$6,389; 32 cases, \$2,990; Bristol, 3 cases, \$366; British East Indies, 24 cases, \$773; 19 packages, \$6,300; British West Indies, 12 cases, \$660; Brussels, 23 cases, \$769; Central America, 322 packages, \$1,161; Chili, 8 packages, \$259; Cuba, 68 cases, \$2,150; Genoa, 50 packages, \$8,844; Glasgow, 15 cases, \$508; 27 electrical cables, \$11,116; Hamburg, 55 packages, \$3,779; Havre, 4 packages, \$503; Liverpool, 17 packages, \$778; London, 24 packages locomobiles, \$7,500; Manchester, 26 packages motor trucks, \$1,200; 140 packages, \$22,063; Mexico, 47 packages, \$140; 9,411 packages electrical railroad material, \$14,439; 1 crate electrical machinery, \$80; 1 motor carriage, \$909; Milan, 20 packages, \$1,274; Naples, 12 cases, \$1,250; Peru, 20 packages, \$417; Rotterdam, 1 package, \$40; Southampton, 24 cases, \$1,073; St. Petersburg, 2 cases, \$106; U. S. Colombia, 3 cases, \$49; Venezuela, 157 cases, \$1,041.

PERSONAL MENTION.

Mr. H. F. Parshal, an American engineer interested in Charles T. Yerkes' projected underground electric railway in London, arrived in this city January 6 from Liverpool. He said he came to place with American firms a large order for railway supplies needed in Great Britain.

Mr. C. Taylor Leland was recently elected president of the Quakertown (Pa.) Traction Company.

Mr. Frank Hibbard was recently appointed superintendent of transportation of the New York and Queens County trolley system, taking the place made vacant by the retirement of George H. McDonnell.

Mr. Robert H. Forderer has been elected president of the Keystone Telephone Company of Philadelphia, to succeed Alexander Balfour, who will retain his place in the board of directors.

Mr. Everett Frazar, who represented the Korean Government in the United States, died January 3 at Orange, N. J. Mr. Frazar established the mercantile firm of Frazar & Co., which is still in existence in Shanghai, China. Of late years this firm has been actively engaged in the introduction of electric lighting in Japan and China.

INCORPORATIONS.

The San Bernardino Gas & Electric Company, San Bernardino, Cal. Capital stock, \$200,000. Directors: C. R. Lloyd, W. S. Hoper, E. D. Roberts, W. F. Jordan and J. W. Curtis.

The Hinton Electric Light, Ice & Fuel Company, Hinton, W. Va. Capital stock, \$100,000. Incorporators: J. Leslie, F. W. Gilbert and others.

The New Martinsville Ice & Electric Company, New Martinsville, W. Va. Capital stock, \$15,000. Incorporators: J. Scally, G. B. Woodcock, C. Beck and others.

The Consolidated Ice & Electric Company, Cambridge, Ill. Capital stock, \$100,000. Incorporators: P. C. Patterson, H. O. Barber, Charles S. Tumbough, John L. Locke and Y. H. Bevington.

The Florida Peninsular Transportation Company, Tampa, Fla.—to build and operate an electric railroad from St. Petersburg on the western coast to Tampa, and will maintain several water lines of transportation. Capital stock, \$1,000,000.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED JANUARY 1, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

664,863. Fender for Cars, etc. George Hipwood, Boston, Mass. Filed June 9, 1900.

664,992. Trolley for Electric Railways. Louis d'Orville Chabut, Pittsburg, Pa. Filed June 14, 1900.

665,051. Electric Traction. Samuel G. Bennett, Wolverhampton, Eng. Filed Oct. 13, 1900.

665,094. Means for Electrical Car Propulsion. John H. Hertner, Cleveland, O. Filed Aug. 6, 1900.

665,248. System of Electric Traction. Lowell M. Maxham, Boston, Mass. Filed April 28, 1900.

665,869. Trolley. Hermann Lachenmeyer, Dusseldorf, Germany, assignor to Commanditgesellschaft Spiegel, Nacken & Co., Cologne, Germany. Filed Feb. 20, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

664,971. Incandescent Lamp. Edward Riordan, New York City. Filed April 5, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

664,907. Electric-Elevator Controller. Barrington S. Stephens, New York City, assignor to the Electrical Appliance Company, Jersey City, N. J. Filed March 17, 1899. Renewed May 24, 1900.

664,948. Electric Meter. Caryl D. Haskins, Newton, Mass., assignor to the General Electric Company of New York. Filed July 29, 1899.

664,969. Electric Motor for Railways. Edward D. Priest, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Jan. 30, 1897.

664,986. Electric Switch. George H. Whittingham, Baltimore Md. Filed March 19, 1900.

665,087 665,320. Controller for Electric Motors. Frank W. Garrett, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Sept. 25, 1900. March 26, 1900.

665,127. Controller for Electric Motors. George H. Parmelee, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed July 25, 1900.

665,133. Electrical Valve-Controller. Clarence B. Riggs, New Rochelle, N. Y. Filed Feb. 3, 1900.

665,139. Control of Electric Motors. Bennet C. Shipman, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Original application filed Aug. 5, 1899. Divided and this application filed May 29, 1900.

665,143. Control of Electric Motors. Emmett W. Stull, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed June 5, 1900.

665,144. Controller for Electric Motors. Emmett W. Stull, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed June 16, 1900.

665,156. Double-Pole Switch. Robert E. Wood, Baltimore, Md. Filed Aug. 28, 1900.

665,305. Electrical Transformer. Arthur F. Berry, London, Eng. Filed July 23, 1900.

665,318. Electric-Motor Controller. Frank W. Garrett, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Aug. 24, 1899.

665,322. Safety Device for Electric-Motor Controllers. Frank W. Garrett and George H. Parmelee, Johnstown, Pa., assignors to the Lorain Steel Company of Pennsylvania. Filed June 16, 1900.

665,324. Means for Controlling Electric Motors. John Green and George C. Thom, Johnstown, Pa. Filed June 15, 1900.

665,337. Electric-Railway Motor. Frank A. Merrick, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Dec. 30, 1899.

665,350. Electric-Motor Control. Bennet C. Shipman, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Aug. 5, 1899.

TELEPHONES AND TELEPHONE APPARATUS.

664,904. Microphone. August H. Skold, Stockholm, Sweden. Filed Dec. 22, 1897.

664,941. Telephone Attachment. George W. Ganoe, Phillipsburg, Pa., assignor, by direct and mesne assignments, of two-thirds to William C. Prickett and John S. Furst, Williamsport, Pa. Filed July 2, 1900.

665,134. Telegraph or Telephone Call Mechanism. Edgar E. Salisbury, Chicago, Ill., assignor to the National Automobile Company, same place. Filed March 21, 1900.

665,251. Mouthpiece for Telephone-Transmitters. Winfield S. Moore, Indianapolis, Ind. Filed May 21, 1900.

MISCELLANEOUS.

664,865. Burglar-Alarm. James H. Howard, Kansas City, Mo., assignor to the Howard Electric Company, same place. Filed Oct. 5, 1899.

664,868. Electrically-Operated Cut-Off Valve for Engines. Louis Johnson, Milwaukee, Wis., assignor of one-half to Albert C. E. Icke, same place. Filed Nov. 18, 1899.

664,869. Electric-Wave Telegraph. Warren S. Johnson and Charles L. Fortier, Milwaukee, Wis., assignors to the American Wireless Telegraph Company, same place. Filed Feb. 16, 1900.

664,915. Electrical Device for Determining the Resistance or Conductivity of Bodies. Henry E. Warren, Newton, Mass. Filed Jan. 27, 1896.

664,953. Electrical Resistance-Board. Willis R. King, Newark, N. J., assignor to the Hanson & Van Winkle Company of New Jersey. Filed July 21, 1900.

664,966. Electrothermostatic Cable for Fire-Alarms. Adolph Munker, Schoeneberg, Germany. Filed April 14, 1900.

665,027. Printing Telegraph. Henry Mahnen, New York City. Filed March 8, 1900.

665,040. Automatic Fire-Alarm. Albert R. Thompson, Indianapolis, Ind., assignor of two-thirds to Clarence M. Zener and John Wocher, same place. Filed Sept. 22, 1899.

665,064. Electrolytic Cell. Edwin D. Chaplin, Winchester, and Henry G. Halloran, Boston, Mass. Filed May 29, 1899.

665,065. Fuse-Holder. Warren R. Cook, Pittsburg, Pa. Filed April 18, 1900.

665,186. Electric Shuttle-Motion for Looms. John M. Cryer and William E. Bullen, Poulton-le-Fylde, Eng. Filed Sept. 4, 1900.

665,195. Storage Battery. Aubrey G. Eneas, Boston, Mass. Filed Oct. 9, 1897. Renewed June 13, 1900.

665,319. Alarm Device for Armature Shafts. Frank W. Garrett, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Sept. 16, 1899.

665,321. Method of Controlling Electric Motors. Frank W. Garrett, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Original application filed Aug. 24, 1899. Divided and this application filed March 26, 1900.

665,352. Electric Fuse-Box. Emmett W. Stull, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed March 21, 1900.

665,362. Driving Mechanism for Dynamos. William L. Bliss, New York City, assignor to the Bliss Electric Car Lighting Company, East Orange, N. J. Filed April 2, 1900.

DESIGN.

33,823. Casing for Arc-Lamps. Allyn B. Walton, Lorain, O., assignor to the National Vapor Stove & Manufacturing Company, same place. Filed Dec. 5, 1900. Term of patent 14 years.

THE TELEPHONE WORLD.

Erie Telephone Company's Affairs.

A dispatch from Boston says: "A circular has been issued by the Erie Telephone & Telegraph Company, announcing that to meet a floating indebtedness of \$6,000,000 coming due within the next eight months, and to provide for necessary improvements, it was proposed to issue \$7,500,000 in one-year notes, bearing 5 per cent. interest. It is said that the note issue will be financed by the Old Colony Trust Company of this city, on behalf of a bankers' syndicate, and that in order to accomplish this it was necessary for the Telephone, Telegraph & Cable Company of America to part with a large part of its holdings of Erie stock, which aggregated \$10,000,000. The transfer of the controlling interest in the Erie Company is not denied by the officials, who say that while the Boston syndicate has obtained a managing interest, the change will not affect the Erie Company nor its subsidiary interests."

A special meeting of the Erie Telegraph & Telephone Company will be held at 100 Broadway, New York, to-day, January 9, for the purpose of authorizing the directors to mortgage the property to secure the payment of obligations, or of debt contracted in transacting the company's business.

From Charleston, S. C., comes the report that the independent telephone companies are bringing big opposition to the Bell Company, and the State system will cover a rich territory. The ten new companies that have been chartered have an aggregate capital stock of \$767,500. They are as follows: Sea Island Telephone Company and Island Telephone Company, Charleston, \$10,000 and \$4,000, respectively; Ashworth Electrical Company, Chesterfield, \$100,000; Georgetown & North Island Telephone Company, Georgetown, \$1,000; Ninety-six Telephone Company, Greenwood, \$1,000; Blenheim & Brownville Telephone Company, Marlboro, \$500; Consolidated Telephone Company of South Carolina, Richland, \$100,000; South Carolina Long Distance Telephone Company, Richland, \$500,000; Glenn Springs Telephone Company, Spartanburg, \$500; Citizens' Telephone & Telegraph Company, Spartanburg, \$50,000.

The first of last year the rates of the Forman, N. D., Telephone Company were \$2 for business and \$1.50 for residence telephones. During the past summer the Wahpeton and Lisbon exchanges in that State, the only exchanges owned by the company, have been practically rebuilt, and the rates now are \$2 for business telephones, \$1.50 for single lines to residences, and \$1 per month for party lines, two on a line. The rates therefore for business telephones have not been raised, and instead of being dissatisfied the subscribers are having the best service they ever had. This is evidenced by the fact, says Robert Hannah, secretary of the company, that the number of subscribers is increasing every week.

The Texas Railroad Commission, in its annual report, which was filed with Gov. Sayers a short time ago, makes several recommendations for the enactment of laws extending its powers over railroads and other common carriers within the State. It also recommends the enactment of a law giving it authority to regulate the rates and charges of all telegraph and telephone companies doing business in the State, and to compel all such companies to maintain general offices in the State.

Assemblyman Sanders of Manhattan will introduce a bill regulating telephone tolls in New York City. The exact figure for rentals has not been decided upon yet, but sweeping reductions may be anticipated from this statement of the Assemblyman: "I believe the people of New York have been too long robbed by the telephone monopolies and I intend to try and effect a radical change."

The Colesville, N. J., telephone project is now moving along slowly, but surely. Nearly every one in the upper end of the township is now interested, and there is a possibility that the line will be continued to Port Jervis, N. Y. It will prove a great convenience to the people along the route.

A representative of the Wisconsin Telephone Company has again visited Marshfield, Wis., for the purpose of making overtures for admission of a line. He states that the company is now willing to come into the city and agree in writing to operate a long distance line only.

The Mutual Telephone Company will shortly establish a local exchange in East Des Moines, Ia. The board of directors at its next meeting will be asked permission to lay a cable of twenty wires to the east side and establish the exchange with a capacity of 600 wires.

The South Shore Telephone Company has its service in operation in Sea Cliff, N. Y. Nearly fifty subscribers are enrolled.

Reduction of Telephone Rentals.

The Southern New England Telephone Company recently announced a general reduction of telephone rentals in all exchanges in Connecticut where the number of subscribers is less than 100. The cut is an important one and effects 15 towns and 1,500 subscribers.

The present rates for party service, covering the town in which the exchange is located, makes the charge for domestic or house service \$24, and for business purposes \$30, with somewhat higher rates for adjoining towns embraced in the exchange, according to the distance from the exchange to the center of the town.

The new rate for party line service will be \$18 per annum for domestic or house service, a reduction of 25 per cent., and \$24 for business service, a reduction of 33 1/3 per cent., with a corresponding reduction for adjoining towns.

The exchanges affected by the reduction are Branford, Danielson, Guilford, Litchfield, Manchester, Milford, Naugatuck, New Milford, Ridgefield, Rockville, Southington, Saybrook, Simsbury, Wallingford and Winsted and their connecting towns.

A Rival of the Bell Telephone Company.

The Interstate Telephone Company is engaged in constructing long distance lines connecting in the first instance towns in Eastern Pennsylvania and New Jersey, and later it is expected the cities of New York and Philadelphia. The line from Trenton to Hazleton will soon be completed and the link between Hazleton and Wilkes-Barre, with but a single pair of wires for the present, has just been opened for business. The local line between Wilkes-Barre and Hazleton in contemplation by the People's Company cannot be built for a considerable time, but in the meantime the Interstate Company at a moderate charge will take messages through the People's Company exchange.

When a telephone line is installed by the side of an electric trolley road the influence exercised by the trolley upon the telephone is disturbing to the telephonic connection, the noise caused by the passing of the cars being distinctly heard. Experiments recently made at Basel, in Switzerland, with the object of finding a remedy, have conclusively demonstrated that the only practical solution is to entirely insulate the telephone by employing a return. In Switzerland, where most all the telephonic connections are on single wire, it would cost about \$5,000,000 to make this change.

Telephone service at Purcell, Indian Territory, is being improved by the putting in of new switchboards with 100 drops, and a new cable into the exchange. Long-distance service in every direction is already available, connections with Missouri River points is in sight, and there is a demand for the connecting of the local circuit with the long distance lines.

Representatives of the independent telephone companies of Columbiana County, recently met at Salem, O., and organized the Columbiana County Independent Telephone Association. The Columbiana County, the Eastern Ohio, the Damascus and the Winona Companies were represented.

The Plymouth, Wis., Telephone Exchange has been incorporated as a stock company. The following have been elected directors: B. W. Rowe, Henry Timm, H. W. Hostman, Charles Pfeifer and Dr. Frank Derrwaldt. The city council has granted the company a franchise to construct and maintain a system.

The local telephone company of Hamburg, N. Y., has added a line to East Eden, N. Y., and made connections. It will add a line to Eden Center, which will be in readiness shortly. The company also contemplates a service at West Seneca, N. Y. The local organization has about one hundred patrons although it has been in existence about a year.

The Southern New England Telephone Company, says a Waterbury, Conn., paper, is considering a practical system of duplexing telephone wires, by which, using an auxiliary telephone, conversation with two persons may be held simultaneously on the same wire.

The Fox River, Wis., Valley Telephone Company has complied with the terms of its franchise, and a toll line system is now in operation in that city.

The Monrovia, Cal., Telephone Exchange is extending its lines, and Duarte in that State is to have the benefit of the service.

An accidental fire in the telephone exchange at Brunswick, Ga., has completely crippled the Southern Bell service.

London's Great Central Exchange.

At the Great Central Exchange in Queen Victoria street, London, the switchboard, which will accommodate many thousands of renters, is being put together rapidly. The switchboard is a triumph of the electrician's mechanical skill, the simplest and most effective that has yet been manufactured, and will prove a great public boon.

London has been much in need of it, for the present telephone system is very trying to the tempers of business men, and the operators have a terribly heavy time. It will be quite a treat to ring up the exchange and not get the vexing reply, "Engaged; ring again, please," meaning, of course, that some other exchange through which your message has to pass is blocked at the time.

People are, therefore, looking forward with no little impatience to the new Post Office 'phones, which will simplify matters so much.

On this new system, so far as the caller is concerned, all that one will be required to do will be to take up the telephone receiver, and the exchange officials will do the rest.

To dispense with technicalities, it may be stated that the act of taking up the 'phone sets in motion a delicate electrical system, in which colored visual signals play a most important part, and the caller is placed in communication with the number he requires.

The signals indicate to the officials when the persons using the system have finished their conversation.

The board of public works of Louisville, Ky., at a recent meeting decided to put up the franchise for a new telephone system at auction on Monday, January 28, at 12 o'clock. The franchise will be sold to the highest bidder. No bid under \$10,000 will be entertained.

The Interstate & Herkimer County Telephone Companies having connected their lines there is now an independent telephone system extending from Amsterdam to Syracuse, N. Y., besides lateral branches.

A number of citizens of Owingsville and Wyoming, Ky., have subscribed sufficient stock to run a telephone line between the two places mentioned. Work on the same will begin at once.

The transfer from the old to the new switchboard of the Port Huron, Mich., Telephone Exchange was recently completed. The city now has one of the most modern plants in the country.

The Belmont Telephone Company of Bridgeport, W. Va., is rapidly completing its work and will soon be ready for operations.

The city council of Temple, Tex., has granted a franchise to Messrs. Boynton and Earle of Waco for a telephone exchange.

A double switchboard is to be placed in the local telephone exchange at Le Roy, N. Y.

The Sunset Telephone Company is preparing to put in a telephone line from Grant's Pass to Williams, Ore.

The Zenith Telephone Company, the anti Bell Company of Minneapolis, Minn., now has 1,330 'phones in use.

There is much dissatisfaction in New Decatur, Ala., with the telephone service of the Bell Company.

The Keystone Telephone Exchange at Norristown, Pa., was destroyed by fire recently.

TELEPHONE INCORPORATIONS.

The Maryland and Delaware Telephone & Telegraph Company, Baltimore, Md.—to maintain and construct telephone and telegraph lines. Capital stock, \$50,000.

The Steuben County Telegraph & Telephone Company, Bath, N. Y. Capital stock, \$2,000. Directors: J. S. Bowley and W. D. Carroll, Bath; D. F. Ward, Savonia.

The Interior Telephone Company, Cedar Rapids, Ia. Capital stock, \$10,000. Incorporators: E. J. C. Bealer, J. M. Restein, E. E. Wood and W. Hubbard.

The Bath and Cameron Telephone Company, Bath, N. Y. Capital stock, \$400. Directors: Albert Crandall, A. J. Annabel and A. C. Annabel, all of North Cameron.

The Telephone Company of America, Washington, D. C.—to manufacture telephones and telephone supplies and to operate machine shops and foundries. Capital stock, \$5,000,000.

GENERAL ELECTRICAL NEWS.

Lighting.

Ashkum, Ill.—The citizens of this place are considering the question of putting in electric lights.

Baker City, Ore.—An electric light plant capable of furnishing power and light for a region of six miles in diameter is being talked of in this city.

Barberton, O.—The voters of this village will on January 24 vote on the question of erecting a new power plant. O. C. Barber proposes if the vote be favorable to erect a plant to cost about \$150,000 for light and power.

Buffalo Lake, Minn.—The citizens of this place are agitating the question of erecting an electric light plant.

Canton, Ga.—Capt. T. M. Brady is making preparations for placing an electric dynamo and plant in the Georgia Marble Furnishing Works at this place, of which he is owner and general manager.

Central City, Neb.—This city is considering the advisability of purchasing an electric light plant.

Charlotte, N. C.—Hayden, Wheeler & Schwend of this city want bids on the best gas and electric lighting plant for an office building.

Elnora, Ind.—Dr. J. C. Mitchell, of Odon, was recently here conferring with the town council with reference to erecting an electric light plant.

Fremont, Neb.—The electric light works owned by this city are becoming inadequate, and the building of a new plant is being agitated.

Homer, La.—The citizens of this place are agitating the question of erecting an electric light plant.

Livingston, Mont.—M. Roth is interested in the establishment of a new electric light plant here.

Louisville, Ga.—The council proposes to put in electric lights soon.

Lumberton, N. C.—This city will soon hold an election to decide upon the issuance of \$5,000 of bonds for the construction of an electric light plant.

Montevallo, Ala.—The Legislature has appropriated \$100,000 for completing the electric light plant at the Girls' Industrial School.

Muskegon, Mich.—The stockholders of the Muskegon Electric Light Company have authorized the sale of the plant to Liddon Flick and T. S. Barber of Wilkes-Barre, Pa. Extensive improvements will be made including the consolidation of the power houses. The light company is capitalized for \$65,000.

North Amherst, O.—The citizens will on January 14 vote on the proposition to issue \$15,000 in bonds to build an electric light plant.

Nicholasville, Ky.—This city is considering an issuance of bonds for the erection of an electric light plant.

Renville, Minn.—The citizens of this place are figuring on an electric light plant.

Richmond, Ky.—The Richmond Water & Light Company is arranging for the erection of an electric light plant.

Rockingham, N. C.—This city will petition the Legislature for authority to issue bonds for the erection of an electric light plant.

Rocky Mount, N. C.—This town will apply to the Legislature for privilege to issue bonds to the amount of \$40,000 to put in a sewerage system, erect an electric light plant, and finish the waterworks system.

San Jacinto, Cal.—The city council contemplates the erection of a new electric light plant.

Scotia, Cal.—W. V. Lockwood, representing San Francisco capitalists, is making arrangements to establish an electric light plant here for supplying the valley towns with light and power.

St. Michaels, Md.—This city will erect an electric light plant.

Texarkana, Ark.—The electric light plant here was recently destroyed by fire. The loss was about \$15,000, insurance, \$9,000. Another plant is under course of construction and will be completed in about thirty days.

Tulahoma, Tenn.—The question of establishing an electric light plant is again being agitated, and will doubtless take form within the next few weeks.

Wellsburg, W. Va.—The Wellsburg & Wheeling

Railway Company will establish a plant to furnish electric lights, heat and power to consumers.

Westfield, N. Y.—At a recent meeting of the board of village trustees it was voted to purchase new machinery for the electric plant, sufficient to increase the capacity of the plant 2,000 incandescent lights.

Wilkes-Barre, Pa.—Capitalists of this city, who are about to purchase the Shenandoah electric light and gas plants, are also sure of the Mahanoy City plants, and will build a line between the two towns to light the intermediate hamlets, including St. Nicholas and Gilberton.

Street Railways.

Brooklyn, N. Y.—The Brooklyn Rapid Transit Company will expend about \$3,000,000 in building a new 40,000 horse power motor plant, which is to be erected in South Brooklyn.

Chagrin Falls, O.—The Chagrin Falls & Eastern Electric Railroad Company has increased its capital stock from \$300,000 to \$500,000.

Columbus, O.—New York capitalists are securing the right-of-way for an electric railway from this city to Toledo. This road will be a direct line from here to Tiffin. It will be the third-rail system, and cars will run about 50 miles an hour.

Galveston, Tex.—C. E. Hotchkiss, purchaser of the Galveston City Railroad, will expend about \$200,000 in re-equipping and improving its power system, etc.

Greenwich, Conn.—The warden and burgesses of the town recently filed their permission to the Greenwich Tramway Company to lay tracks for a trolley system.

Hagerstown, Md.—The Hagerstown Electric Railway will be extended to Beaver Creek, Mapleville, Boonsboro, Keedysville and the Antietam battlefield.

Hellertown, Pa.—The contract for the building of the trolley line from Richlandtown to this place, a distance of ten miles, has been signed, and work will soon begin. With the closing of this link there will be a continuous trolley road from North Wales to Allentown.

Huntington, Ind.—The city council has agreed to grant a franchise to the Ft. Wayne & Southwestern Electric Road. The line will also be built to Warren in the southeastern part of the county.

Lisbon, O.—The last right-of-way has been secured for the projected electric railway from here to East Liverpool by way of Pleasant Heights.

New York City.—The New York Railroad Commission is to give a hearing on January 25 to the Buffalo, Rochester & Niagara Falls Railroad Company's application for permission to construct an 80-mile trolley railroad, which will practically parallel the New York Central Railroad.

Ravenna, O.—A new electric railway will probably be constructed between Akron and this place. The road will pass several lake resorts in this section of the country.

Reading, Mass.—Col. Woodward is to build a new electric road, with the latest modern equipment, from here to Wakefield Center out through Montrose to Mansfield's Corner at South Lynnfield.

Saco, Me.—A petition for articles of association was lately filed with the railroad commissioners for the Saco valley electric railway, beginning and running through this place and Buxton to Bonney Eagle, in the town of Standish. The directors named are Harry A. McNeally, James O. Bradbury and William J. Maybury, all in Saco. Francis S. Hobart, of Braintree, Mass., and Ebenezer B. Loring, of Boston. The capital stock is \$250,000 and the length of the proposed road 20 miles.

South Charleston, O.—Application will soon be made to the board of county commissioners for right of way between Springfield and this city for the construction of an electric railway. L. H. and E. Houston are the promoters.

Taylorville, Ill.—D. M. Sharp contemplates the construction of an electric railway from Grove City and Mt. Auburn to this place.

Toledo O.—The Toledo, Fremont & Norwalk Electric Road inaugurated its freight system a short time ago.

Manufacturing.

Bridgeport, Conn.—The Cahill Electric Typewriter Company of Washington, D. C., is to locate in this city. The company makes a typewriter which uses electricity to operate the letter, a slight pressure on the key being all that is required.

Chicago, Ill.—Jacob Zaun, W. H. Wisler, and Matthew Stotter are interested in the Liberty Incandescent Light Company, which has been formed to manufacture lighting and heating apparatus on a capital of \$2,500.

Ft. Wayne, Ind.—It is the intention of the Belden-Larwill Electric & Manufacturing Company to further enlarge the plant and engage in the manufacture of dynamos and transformers. Mr. Gustave Hackins now has charge of the office.

Los Angeles, Cal.—The manufacture of insulated wire will be begun in this city February 1. The officers of the company are Wallace L. Hardison, president; Guy L. Hardison, vice-president; Frank Taylor, secretary, and Lewis W. Andrews, treasurer.

Company Matters.

Columbus, O.—The Columbus, Winchester & Lancaster Traction Company was granted a franchise a short time ago by the county commissioners. T. Simons is president of the company.

Richmond, Va.—The Richmond Traction Company has awarded to the American Car Company of St. Louis the contract to build for it 51 modern summer cars. The cost of these cars range from \$875 to \$1,175 each.

Zanesville, O.—The Southeastern Ohio Black Diamond Belt & Terminal Company of this city has changed its name to the Black Diamond Traction Company.

Power and Transmission.

Idaho Springs, Col.—The Idaho Springs Electric Light, Power & Heating Company, composed of local capitalists, is said to be contemplating additions amounting to about \$50,000 to its plant, and it is reported that a new modern plant will be erected by the company at an early date.

Philadelphia, Pa.—Capitalists of this city have under consideration a plan to employ water power as a substitute for steam in the production of electricity. It is proposed to utilize the waters of some accessible river and transmit the electricity by cable to this and other cities for electric railways, lighting and power supply. Officials of the Union Traction Company and the Philadelphia Electric Company discussed the feasibility of the plan and a representative is now investigating it.

Richmond, Va.—It is expected that the large power plant of the Virginia Electric Railway & Development Company in this city will be in operation by March 1 at the latest.

Winston, N. C.—The practical reorganization of the North Carolina Electrical Power Company has taken place. This company is developing the water power of Ivy River near Asheville. Messrs. J. S. Carr, of Durham; Capt. H. R. Lemly, of Washington City; J. A. Vance and Spach Bros. of Salem, are among the stockholders.

Automobiles.

Boston, Mass.—The electric busses recently tried on the streets of this city have proven a success.

Occoquan, Va.—It is understood that the Virginia Automobile Company will locate its factory on the creek near here, and take advantage of the splendid water power to run its machinery.

Providence, R. I.—The first meeting of the Rhode Island Automobile Club, which was recently organized, was held last week in this city, and the following officers were elected: Dr. Julian A. Chase, president; H. A. DuVillard, vice-president; R. Lincoln Lippitt, treasurer; Frederick C. Fletcher, secretary.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by **ELECTRICITY** from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g. gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

NAME.	Par	Authoriz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Authoriz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—Jan 7.							Hartford Conn.—Jan 7						
United Traction.....	100	\$5,000,000	\$5,000,000	1½ % Q.	110	111	Hartford Street Ry. Co.....	100	\$4,000,000	\$300,000	8 % S., Oct.,	150	—
(Consolidation of the Albany and Troy City Railway.)							Hartford & West Hartford RR.....	100	1,000,000	247,000	—	—	—
Allentown Pa.—Jan 7							Holyoke Mass.—Jan 7						
Allentown & Lehigh Val. Trac. Co.....	—	4,000,000	1,500,000	—	—	15	Holyoke Street Ry. Co.....	100	400,000	400,000	8 % A., June,	207½	212
Bridgeport, Conn.—Jan 7:							Hoboken N. J.—Jan 7						
Bridgeport Traction Co.....	100	2,000,000	2,000,000	1 % Aug.	100	—	North Hudson Co. (N. J.) Ry. Co....	25	1,250,000	1,000,000	8 %	150	—
Baltimore Md.—Jan 7.							Indianapolis, Ind.—Jan 7						
United Railways & Elec. Co.....com.	50	24,000,000	13,000,000	—	18½	18¾	**Indianapolis Street Ry.....	—	5,000,000	5,000,000	—	27	29
Boston, Mass.—Jan 7							Lancaster, Pa.—Jan 7						
New England Street Ry.....	25	5,000,000	1,081,925	1 % Q., Jan. 15,	—	—	Pennsylvania Traction Co.....	100	10,000,000	9,900,000	—	—	—
North Shore Traction Co.....com.	100	4,000,000	4,000,000	—	15	16	Lancaster & Col. Electric Ry.....	—	—	87,500	—	—	—
North Shore Traction Co.....pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87	West End Street Railway.....	—	—	—	—	—	—
West End Street Ry. Co.....com.	50	10,000,000	4,000,000	8 % S., Oct., '99.	98	98½	Louisville, Ky.—Jan 7.						
West End Street Ry. Co.....8 % pfd.	50	10,000,000	6,400,000	4 % S., Jan.	112	113	Louisville Ry.....com.	100	4,000,000	8,500,000	1½ %	82	83
Boston Elevated R. R.....	100	10,000,000	—	2½ % Aug. 99,	156	157	Louisville Ry.....pfd.	100	2,500,000	2,500,000	2½ % S., Oct. 1,	112	113
Brooklyn N. Y.—Jan 7:							Minneapolis, Minn.—Jan 7						
Brooklyn City Ry.....	100	2,000,000	1,928,400	—	238	238	Twin City Rapid Transit.....com.	100	17,000,000	15,010,000	—	68½	68½
Brooklyn Rap. Transit Co., tr. certf..	100	48,000,000	48,000,000	—	84½	85	Twin City Rapid Transit.....7 % pfd.	—	8,000,000	1,712,200	1½ % Oct.	186	187
Brooklyn Heights Railroad.....	—	200,000	200,000	—	107	109	Montreal, Canada.—Jan 7						
Brooklyn City RR.....guar.	100	12,000,000	12,000,000	8 % Q., Jan.,	267	289	Montreal Street Ry. Co.....	50	4,000,000	4,000,000	6 % S., M. & N.	271	273
Brooklyn, Queens Co. & Sub. RR.....	100	2,000,000	2,000,000	—	—	—	Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1½ % S., J. & J.	107½	107½
Coney Island & Brooklyn RR.....	100	2,000,000	1,884,200	2½ % Nov., '99.	325	332	Memphis Tenn.—Jan 7:						
Kings County Elevated.....	—	4,750,000	4,750,000	—	—	—	Memphis Street Railway Co.....	100	500,000	500,000	—	25	—
Kings County Traction Co.....	100	4,500,000	4,500,000	1 % July	75	80	New Haven, Conn.—Jan 7:						
Nassau Electric Railroad.....pfd.	50	6,000,000	6,000,000	—	—	—	Fair Haven & Westville RR.....	25	2,000,000	2,000,000	8 % S., Sept.	89	41
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000	—	—	—	New Haven Street Railway Co.....	100	1,250,000	1,000,000	2½ % A., July	—	—
Brooklyn, B. & W. E. Railroad.....	—	1,000,000	1,000,000	—	—	—	New Haven & Centerville.....	100	700,000	800,000	—	—	—
Buffalo N. Y.—Jan 7:							Winchester Avenue RR.....	25	1,000,000	600,000	—	45	46
Buffalo & Niagara Falls Elec. Ry.....	100	1,250,000	1,250,000	—	74	75	New Orleans, La.—Jan 7						
Buffalo Railway Co.....	100	6,000,000	5,870,500	1 % Q. Dec., '99.	99	100	Canal & Claiborne RR. Co.....	40	240,000	240,000	4 % S., July,	—	—
Columbus O.—Jan 7							New Orleans & Carrollton RR.....	100	1,200,000	1,200,000	1½ % Q., Oct.	148½	153
Columbus Street Railroad.....	100	8,000,000	8,000,000	1 % Q., Feb.	38	42	New Orleans Traction Co new com.	100	—	—	—	22½	24
Columbus Street Railroad, pfd.....	100	1,500,000	1,500,000	—	92	94	New Orleans Traction Co new pfd.	100	—	—	—	96	96
Charleston, S. C.—Jan 7							Crescent City RR.....guar.	100	2,000,000	2,000,000	8 % S., Jan.,	20½	26
Charleston City Ry. Co.....	50	100,000	100,000	8 % S.	—	—	New Or. City & Lake RR.....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	—	—
Enterprise City RR. Co.....	25	1,000,000	250,000	—	—	—	Orleans Railroad.....	50	500,000	185,000	1½ %	52	52
Chicago, Ill.—Jan 7							St. Charles Street Railway.....	50	1,000,000	1,000,000	1½ % Oct.,	56½	57
Chicago City Ry. Co.....	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99.	258	25	New York—Jan 7:						
Chicago & South Side R. T. RR.....	100	10,828,800	10,828,800	—	9½	10	Central Crosstown RR.....	100	500,000	500,000	2½ % Q.	255	300
Lake Street Elevated RR.....	100	10,000,000	10,000,000	—	27	29	Christopher & 10th Sts. RR. guar.	100	500,000	500,000	2½ % Q., Oct.	175	185
Metropolitan West Side Elev. Ry.....	100	15,000,000	7,000,000	Feb 28 1900.	80	81	Dry Dock, E. Brd'w'y & Battery RR.	100	1,200,000	1,200,000	1½ % Q., Nov.	120	185
Met. West Side El., pfd.....	100	15,000,000	9,000,000	—	209	210	Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000	2½ % Q., Feb., 1900.	167½	167½
North Chicago Street RR.....	100	10,000,000	6,000,000	8 % Q., Jan.	197	200	Bleecker St. & Fulton Fy. Ry. guar.	100	900,000	900,000	2½ % A., July,	85	87
South Chicago City RR.....	100	500,000	249,900	—	99½	101	Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000	2½ % Q.	282	287
South Chicago City Railway.....	100	2,000,000	1,608,200	—	98	98½	Oen. Park, N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2½ % Q.	192	200
West Chicago St. RR. Co.....	100	20,000,000	18,189,000	1½ % Q., Feb.	18	18½	Elighth Avenue RR.....	100	1,000,000	1,000,000	4½ % Q.	890	405
Union Traction Ry. Co.....com.	—	1,250,000	624,900	85 %	49½	50	42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	4½ % Q.	892	402
Union Traction Co.....pfd.	100	2,000,000	2,000,000	5 % S.	—	—	Ninth Avenue RR.....guar.	100	800,000	800,000	—	198	201
Cincinnati, Ohio.—Jan 7:							Sixth Avenue RR.....guar.	100	2,000,000	2,000,000	—	285	225
Cincinnati Inc. Plane Ry.....com.	50	1,000,000	575,000	—	—	—	Twenty-third St. R. R. Co. guar.	100	600,000	600,000	4½ % Q.	400	419
Cincinnati Inc. Plane Ry.....pfd.	50	150,000	150,000	—	—	—	Second Avenue RR.....	100	2,500,000	1,862,000	2 % Q., Jan.,	198	201
Cincinnati, Newport & Gov. St. Ry.	100	8,000,000	8,500,000	2½ % Feb.	75	76	Third Avenue RR.....	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.	129	120½
Cincinnati Street Ry. Co.....	100	18,000,000	14,000,000	1½ % Q., Jan.	124½	125	42d St. Manhat'ly & St. Nich. Av	100	2,500,000	2,500,000	—	65	75
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,300,000	1½ % Q., Jan.	128½	127	*Union (Huckleberry) Ry.....	100	2,000,000	2,000,000	—	190	200
Cleveland, Ohio.—Jan 7:							Newark N. J.—Jan 7:						
Akron, Bed. & Elev. Elec. Ry.....	100	1,000,000	1,000,000	¾ % Jan.	48	50	Consolidated Traction Co. of N. J....	100	15,000,000	15,000,000	—	69	60
Cleveland City Ry.....	100	8,000,000	7,600,000	8-5 % Jan.	102	102½	North Jersey Railway Co.....	100	6,000,000	6,000,000	—	24½	25½
Cleveland Electric Ry.....	100	12,000,000	12,000,000	¾ % Q., Oct., '99.	88	84½	United Elec. Co. of New Jersey..	100	504,000	504,000	11½ % A.	23	24
Detroit, Mich.—Jan 7:							Pittsburg, Pa.—Jan 7:						
Detroit Citizens' Street Ry.....	100	2,000,000	1,250,000	—	100½	—	Allegheny Traction Co.....	50	500,000	500,000	—	27	28
Fl. Wayne & Belle Isle Ry.....	100	1,200,000	1,200,000	—	175	—	Consolidated Traction Co.....com.	50	15,000,000	15,000,000	2 % Jan.	27½	24
Rapid Railway Co.....	100	250,000	250,000	—	90	100	Consolidated Traction Co.....pfd.	50	9,473,850	9,473,850	8 % Nov.	66½	67½
Detroit Electric Railway.....	100	1,000,000	1,000,000	—	—	—	Central Traction Co.....	50	1,500,000	1,500,000	1½ % Nov.	72½	73
Wyandotte & Detroit River Ry.....	100	250,000	200,000	—	100	110	Citizens' Traction Co.....	50	8,000,000	8,000,000	6 % A.	72½	72½
Dayton O.—Jan 7:							Duquesne Traction Co.....	50	8,000,000	8,000,000	6 % A.	—	—
City Railway Co.....com.	100	1,500,000	1,470,600	1½ % Q.	140	145	Pittsburg Traction Co.....	50	2,500,000	2,500,000	8 %	—	—
City Railway Co.....pfd.	100	600,000	600,000	1½ % Q.	170	—	Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2½ %	27	29
People's Street Railway.....	—	1,100,000	1,100,000	—	114	115	Pgh., Allegheny & Man. Trac. Co....	50	8,000,000	8,000,000	2 % Aug.	—	—
							Pittsburg & Birmingham Trac. Ry..	25	1,600,000	1,600,000	1 % Oct.	41	42½
							Pittsburg & West End Ry.....	50	8,000,000	8,000,000	5 % A., June	—	—
							United Traction Co.....com.	50	17,000,000	17,000,000	J. & J.	15	15½
							United Traction Co.....pfd.	50	8,000,000	8,000,000	J. & J.	50½	51

* Unlisted. † Ex div.
 a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & Elec. Co. has been issued in the form of income bonds.
 b Leased to Boston Elevated Railroad Company.
 c Owned by Brooklyn Rapid Transit Company.
 d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
 e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
 f Owned by Kings County Traction Company; road leased to Nassau Electric RR.
 g Owned by Atlantic Ave. RR. and leased to Nassau system.
 h \$30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.
 i \$100,000 of stock owned by North Chicago Street Railroad Company.
 j Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
 k \$ per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$685,100 of stock owned by West Chicago Street Railroad Company.
 l Majority of stock owned by Chicago West Division Railway Company; 5 % on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
 m Indianapolis St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex-div.
 a Leased to New Orleans Traction Company at 6 % on stock.
 b Leased to New Orleans Traction Company at 8 % on stock.
 c Leased to Central Crosstown Railroad at 5 % on stock and interest on bonds.
 d Operating the former Met. Trac. system, that corporation having become extinct.
 e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
 f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway
 g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
 h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1896, at \$215,000 per annum.
 i Leased to Metropolitan Street Railway for 18 % on stock.
 j Leased to Met. St. Ry. for 9 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.
 k Leased to Metropolitan Street Railway for \$145,000 per annum.
 l Leased to Metropolitan Street Railway for 18 % on capital stock.
 m Controlled by Third Avenue Railroad by purchase.
 n Dividends of 1½ % yearly guaranteed by Consolidated Traction Company.
 o Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.
 p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
 q Leased to Fort Pitt Traction Company for 6 % on \$8,000,000 capital stock.
 r Leased to Consolidated Traction Company for 4 % on capital stock.
 s Leased to Consolidated Traction Company for 7 % on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Capital Stock.		Rate and Date of Last Div.	Bid.	Asked.	NAME.	Capital Stock.		Rate and Date of Last Div.	Bid.	Asked.
	Par	Author'd Issued.					Par	Author'd Issued.			
New Bedford Mass.—Jan 7	100	\$850,000	\$850,000	2 %	Feb.	160	165				
Union Street Railway Co.	100	800,000	225,000	4 % A.	June.	170	178				
Northampton Mass.—Jan 7											
Northampton Street Ry.	100	5,000,000	5,000,000	3 % A. and N.		55	65				
Omaha, Neb.—Jan 7											
Omaha Street Ry.	100	1,250,000	1,250,000			54	—				
Paterson, N. J.—Jan 7											
Paterson Ry. Co.	100	8,000,000	8,000,000	3 %	Oct. '98	119	111				
Providence, R. I.—Jan 7											
United Traction & Electric Co.	100	2,000,000	1,770,000	2 %	Dec. '99	28	24				
Philadelphia.—Jan 7											
Fairmount Park Trans. Co.	50	1,966,100	1,966,100	2 %	July 15, '99	47	48				
Hestonville, Man. & Fairmount.	50	588,900	588,900	2 %	July 15, '99	76	76				
Hestonville, Man. & Fairmount.	50	800,000	800,000	3 %	Feb. 1, '99	75	76				
Union Traction Co.	50	80,000,000	29,980,450			35	36				
Electric Traction Co.	50	8,297,920	8,297,920								
Frankford & Southwark Pas. R.	50	1,000,000	1,000,000	3 %	share Q.	845	—				
Lehigh Avenue Ry. Co.	50	1,000,000	1,000,000	3 %	share A.—Apr. '98	450	451				
Lombard & Third Streets Ry.	25	1,000,000	1,000,000	A. & O.		90	90%				
Second & Third Streets Ry.	50	1,000,000	1,000,000	3 %	share A, Mar. '98	300	—				
People's Traction Co.	50	10,000,000	16,000,000	3 %	A., April, '98	150	151				
Green & Oostes Passenger Ry.	50	1,500,000	1,500,000	3 %	Jan., 1898.	151	152				
Green & Oostes Passenger Ry.	50	1,500,000	1,500,000								
People's Passenger Ry.	25	1,500,000	1,500,000								
People's Passenger Ry.	25	1,500,000	1,500,000								
Philadelphia Traction Co.	50	80,000,000	30,000,000	3 %	share, Oct. '98	15%	76%				
Catherine & Bainbridge St.	50	1,000,000	1,000,000	3 %	share, July, '98	108	107				
Continental Pass. Ry.	50	1,000,000	1,000,000								
Empire Passenger Ry. Co.	50	1,000,000	1,000,000								
Philadelphia City Pass. Ry.	50	1,000,000	1,000,000								
Philadelphia & Gray's Ry. R.R.	50	1,000,000	1,000,000								
Bridge Avenue Passenger Ry.	50	1,000,000	1,000,000								
Philadelphia & Darby Ry. guar.	50	1,000,000	1,000,000								
15th & 19th Sts. Pass. Ry. guar.	50	1,000,000	1,000,000								
Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	1,000,000								
Union Passenger Ry. Co.	50	1,500,000	1,500,000								
West Philadelphia Pass. Ry.	50	750,000	750,000								
Rochester, N. Y.—Jan 7											
Rochester Railway Co.	100	5,000,000	5,000,000			20	23				
Reading, Pa.—Jan 7											
Reading Traction Co.	—	1,000,000	1,000,000	Semi-an.	Jan. & Jy	24	26				
City Passenger Ry.	50	850,000	850,000	Jan., '98		138	—				
East Reading Electric Ry.	50	1,000,000	1,000,000	Jan., '98		70	—				
St. Louis, Mo.—Jan 7											
Fourth Street & Arsenal Ry.	50	800,000	150,000								
Jeherson Avenue Ry. Co.	50	400,000	400,000	2 %	Dec., 1888.	—	—				
Lindell Ry.	50	2,500,000	2,400,000	1 %	Jan., '99	—	—				
National Railway Co.	100	2,500,000	2,479,000	1 %	Jan., '99	—	—				
Cass Avenue & Fair Grounds.	—	2,500,000	2,500,000								
Citizens R.R.	100	2,000,000	1,500,000	4 %	Oct., '98	—	—				
St. Louis R.R.	100	2,000,000	2,000,000	2 %	Jan., '99	—	—				
Missouri R.R.	50	2,400,000	2,800,000	1 %	Jan., '99	—	—				
People's R.R. Co.	50	1,000,000	800,000	50c.	Dec., '89	18	19				
United Electric Ry.	50	500,000	500,000			46	44				
United Electric Ry.	50	1,000,000	1,000,000	3 %	Jan., '99	65	65				
St. Louis & Suburban Ry.	100	2,500,000	2,500,000			68	70				
Union Depot R.R.	100	4,000,000	4,000,000	3 %	A., July, '99	—	—				
San Francisco, Cal.—Dec											
California St. Cable R.R.	100	1,000,000	600,000	50c.	monthly.	117	119				
Geary Street Park & Ocean R.R.	100	1,000,000	875,000	\$2.50	share, '96	60	—				
Market Street Ry.	100	18,750,000	18,750,000	Q., 60c.	per share.	61%	68%				
Presidio & Ferries R.R.	100	1,000,000	550,000			—	16				
Scranton Pa.—Jan 7											
Scranton Railway Co.	50	6,000,000	2,500,000			29	30				
Scranton & Carbondale Trac. Co.	100	500,000	500,000			16%	—				
Scranton & Pottsville Trac. Co.	100	1,050,000	1,050,000			—	—				
Springfield, Mass.—Jan 7											
Springfield Consolidated Ry.	100	750,000	750,000			—	—				
Springfield O.—Jan 7											
Springfield Street Ry.	100	1,000,000	1,000,000			—	11				
Springfield, Mass.—Jan 7											
Springfield Street Ry.	100	1,200,000	1,166,700	8 %	A.	207	212				
Toronto Canada.—Jan 7											
Toronto Street Ry.	100	6,000,000	6,000,000	13 %	8.	108%	109				
Montreal Street Railway Co.	—	4,000,000	4,000,000	4 %	8.	272%	273				
Washington, D. C.—Jan 7											
Belt Ry. Co.	50	500,000	500,000			—	—				
Capital Traction Co.	100	12,000,000	12,000,000	65c.	per sh. Oct. '99	102%	102%				
Columbia Ry. Co.	50	400,000	400,000	6 %	A.	—	—				
Eckington & Soldiers' Home Ry.	50	707,000	652,000			35	40				
Georgetown & Tenallytown Ry.	50	200,000	200,000			29	21				
Metropolitan R.R. Co.	50	1,000,000	458,900	2 %	Q.	—	—				
Worcester, Mass.—Jan 7											
Worcester Traction Co.	100	8,000,000	8,000,000			83%	35				
Worcester Traction Co.	100	2,000,000	2,000,000	8 %	8., Feb.,	104	105				
Worcester & Suburban Street Ry.	100	550,000	542,500	4 %	18%	—	85				
Wilkesbarre, Pa.—Jan 7											
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1 %	Jan.,	25	29				

* Unlisted. † Paid in. ‡ Full paid. § Outstanding. ¶ Ex-div.
 a Leased to Hestonville, Man. & Fairmount Passenger Ry. for 6 % on stock per annum.
 b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
 c Practically all shares owned by Union Traction Company.
 d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
 e Leased to Electric Traction Company.
 f Controlled by Frankford & Southwark Passenger Railway.
 g Leased to People's Passenger Railway at \$5 per share.
 h Majority of stock owned by People's Traction Company.
 i Leased to Union Traction Company.
 j Lease transferred to Union Traction Company.
 k Leased to United Traction Company at a rental of \$10,000 per annum in 1886-7-8 p. a. \$20,000 in 1899-1900 and \$30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.
 l Dividend of 10 % guaranteed by Reading Traction Company.
 m Dividend of 6 % guaranteed by Reading Traction Company.
 n Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

Boston, Mass.—Jan 7											
American Tel. & Tel. Co.	100	50,000,000	28,650,000	4 %	Q., Jan.	154	155				
Erie Telegraph & Telephone Co.	100	10,894,800	10,804,800	1 %	Q., Feb. 20,	99	100				
New England Telephone Co.	100	10,894,800	10,804,800	\$1.50	p. sh. Feb	127%	128				
New York.—Jan 7											
American Telegraph & Cable Co.	100	14,000,000	14,000,000	1 %	Q.	91	94				
*Central & South Am. Tel. Co.	100	6,500,000	6,500,000	1 %	Q.	100	105				
*Commercial Cable Co.	100	10,000,000	10,000,000	1 %	Q.	173	175				
Franklin Tel. Co.	100	1,000,000	1,000,000	1 %	Q.	42	50				
Erie Telegraph & Telephone Co.	100	5,000,000	4,800,000	1 %	Q., Feb.,	116	118				
*Gold & Stock Tel. Co. guar. 6 %	100	5,000,000	5,000,000	1 %	Q.	116	118				
*International Ocean Tel. Co. guar. 6 %	100	8,000,000	8,000,000	1 %	Q.	116	118				
Mexican Telephone Co.	100	2,000,000	2,000,000	1 %	Q.	116	118				
*New York & New Jersey Tel. Co.	100	5,000,000	4,728,000	2 %	Q., Jan.,	175	180				
*Pacific & Atlantic Tel. Co. guar. 4 %	100	2,000,000	2,000,000	1 %	Q.	70	75				
*Postal Telegraph Cable Co. guar. 5 %	100	15,000,000	15,000,000	1 %	Q.	95	100				
*South & Atlantic Tel. Co. guar. 5 %	25	950,000	559,525	2 %	Q.	118	—				
*Commercial Union Telegraph Co.	25	500,000	500,000	3 %	Q., Jan., '99	88%	84				
*Western Union Telegraph Co.	—	—	97,870,000	1 %	Q., Jan. '99	—	—				
† Div. guar. by Postal Tel. Co.	—	—	—			—	—				
Miscellaneous.—Jan 7											
American Dist. Tel. (Phila.)	25	400,000	—	1 %	Q.	26	37				
Bell Tel. Co. (of Canada)	100	2,960,000	2,564,000	2 %	Q.	188	—				
Chesapeake & Potomac Tel. Co.	100	1,000,000	—			47	70				
Chicago Telephone Co.	100	—	—			200	210				
Central Dist. Trg. & Tel. Co. (Pgh.)	100	750,000	750,000			143	150				
Empire & Bay States Telegraph Co.	—	—	—			75	76				
Hudson River Telephone Co.	100	2,000,000	2,000,000	1 %	Q.	119	120				
*Northwestern Telephone Co. guar.	50	2,500,000	2,500,000	3 %	Q.	122	125				
Providence (R. I.) Tel. Co.	50	—	—			56	99				
Southern New Eng. Tel. Co.	100	8,000,000	—			—	—				

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

Boston, Mass.—Jan 7											
Fort Wayne Electric trust receipts..	25	.....	.....	.....	.....	115	125				
† Wayne Elec Co. T. Sec. Series A.	100	40,000,000	30,460,000	2 ½ % Q., Aug., 1898.	.....	15	25				
General Electric Co. [old] com.	100	18,276,000	18,276,000	1 ½ % Q., Apr., 1900	.....	188	188 ½				
T.—H. Elec. Co. T. Secur., Series C.	50	.....	146,700	.....	.....	22	28				
Westinghouse Elec. & Mfg. Co. com.	50	.....	.....	.....	.....	52 ½	54				
Westinghouse El. & Mfg. Co. pfd.	50	4,000,000	8,996,058	1 ½ % Q., Jan.,	.....	84	85				
Westinghouse El. & Mfg. Co. assent.	50	11,000,000	8,195,126	.....	.....	44 ½	45				
New York.—Jan 7											
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	.....	.....	119	120				
* Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1 ½ % Oct., '98.	.....	8	12				
Edison Ore Milling Co. com.	100	.....	.....	.....	.....	.....	.....				
Electric Vehicle Co. com.	100	.....	.....	.....	.....	.....	.....				
† General Electric Co. [old] com.	100	40,000,000	30,460,000	2 ½ % Q., Aug., 1898.	.....	.....	.....				
General Electric Co. [new] "	100	18,276,000	18,276,000	1 ½ % Q., Apr., 1900	.....	189	188 ½				
Interior Conduit & Insulation Co..	100	1,000,000	1,000,000	.....	.....	41	43				
‡ Kings Co. El. L. & P. Co. com.	100	2,500,000	2,500,000	A. & O.	.....	110	125				
Pittsburg, Pa.—Jan 7											
Allegheny County Light Co. com.	100	500,000	500,000	J. & J.	.....	168	172				
East End Electric Light Co. com.	50	800,000	800,000	Q	.....	.....	.....				
Philadelphia, Pa.—Jan 7											
Edison Electric Light Co. com.	100	2,000,000	.....	.....	.....	144	144 ½				
* Electric Storage Battery Co. com.	100	8,500,000	.....	.....	.....	80	84				
* Electric Storage Battery Co. pfd.	100	5,000,000	.....	.....	.....	81	87				
Northern Elec. Light & Power Co..	10	550,000	550,000	.....	.....	18	18 ½				
Southern Elec. Light & Power Co..	10	187,500	187,500	.....	.....	80	80				
Miscellaneous.—Jan 7											
Bridgeport (Conn.) Elec. Lt. Co....	25	500,000	.....	.....	.....	47	48				
Missouri-Edison (St. Louis) com.	100	.....	.....	.....	.....	20	21				
Eddy Electric Mfg. Co. com.	25	.....	.....	.....	.....	9	14				
Hartford (Conn.) Elec. Light Co....	100	850,000	.....	.....	.....	175	176				
Hartford (Conn.) Lt. & Power Co....	25	175,000	.....	.....	.....	6	10				
New Haven (Conn.) Elec. Lt. Co....	100	100,000	.....	.....	.....	195	.....				
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	.....	2 ½ % Q., Oct.,	.....	98 ½	99				
Rhode Island Elec. Protec. Co....	100	.....	.....	.....	.....	118	120 ½				
Royal Elec. Co. (Montreal) com.	25	1,620,000	.....	2 ½ % Q.,	.....	206 ½	208				
Toronto (Canada) Elec. Light Co....	100	1,085,000	1,085,000	1 ½ % Q.	.....	183 ½	185				
Thomson-Houston Welding Co. com.	100	.....	.....	3 ½ % S., Dec. 1,	.....	105	100				
Woonsocket (R. I.) Electric Co....	100	.....	.....	.....	.....	105	106				

BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Jan 7, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co. Cons. mtg. 5s.	\$500,000	437,500	1980	J. & J.	117%	.....
The Albany Ry. Co. Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	116%	.....
Watervliet Turnpike & RR. 1st mtg. 6s.	850,000	850,000	1919	M. & N.	113%	.....
Watervliet Turnpike & RR. 2d mtg. 6s.	180,000	180,000	1919	M. & N.	113%	.....
Troy City Railway Co. 1st 5s	.....	.....	1942	.....	116%	.....

Interest guar. by Albany Ry. Co.
Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Jan 7, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
United Electric Ry. Co. 1st mtg. g. 4s.	88,000,000	18,000,000	1949	M. & S.	102	102%
.....Income 4s.	14,000,000	.....	1949	J. & D.	74%	75
Baltimore City Pass. Ry. 1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118%	.....
Baltimore Traction Co. 1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
Baltimore Trac. Co. Exten. & Imp. g. 5s.	1,250,000	1,250,000	1901	M. & S.	104%	.....
Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s.	1,750,000	1,750,000	1942	J. & D.	121	121%
Bal. Trac. Co. Coll. Trust. 1st mtg. g. 5s.	750,000	.....	1900	J. & J.	101	.....
Baltimore Traction Co. Convertible 5s.	800,000	.....	1908	N. & M.	102%	.....
Central Pass. Ry. Co. 1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	.....
Central Pass. Ry. Co. Cons. mtg. g. 5s.	604,000	580,000	1922	M. & N.	119	121
City & Suburban Ry. 1st mtg. g. 5s.	8,000,000	8,000,000	1922	J. & D.	116	117
Lake Roland Elev. 1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	.....

All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Jan 7, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Lynn & Boston RR. 1st mtg. g. 5s.	5,879,000	8,702,000	1924	J. & D.	114	115
West End Street Ry. Deben. g. 5s.	8,000,000	8,000,000	1902	M. & N.	104%	106
West End Street Ry. Deben. g. 4s.	2,000,000	2,000,000	1914	M. & S.	112	.....

†\$1,674,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Jan 7, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Enterprise Street RR. 1st mtg. 5s.	500,000	47,000	1908	J. & J.	.....	.....
Charleston City Ry. 1st mtg. 6s.	850,000	.....	.....	J. & J.	106	.....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Jan 7, 1900.

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Chicago City Ry. 1st mtg. 4s.	6,000,000	4,619,500	1901	J. & J.	101%	2%
Chicago Passenger Ry. 1st mtg. 6s.	400,000	400,000	1903	F. & A.	.....	102
Chicago Passenger Ry. Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	.....	.....
Chicago & So. Side R. T. 1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	.....	.....
Chicago & So. Side R. T. 4s.	1,500,000	780,000	1907	J. & J.	.....	.....
Chicago West Div. Ry. 1st mtg. 4s.	4,040,000	4,040,000	1922	J. & J.	108%	109
Lake Street Elevated RR. 1st mtg. g. 5s.	7,674,000	8,781,200	1928	J. & J.	.....	.....
Metrop. W. Side Elev. Ry. 1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96%
North Chicago St. RR. 1st mtg. 5s.	8,171,000	8,171,000	1906	J. & J.	106	.....
North Chicago St. RR. Cert. Indeb. 6s.	500,000	500,000	1911	J. & J.	.....	.....
North Chicago City Ry. 1st mtg. 6s.	500,000	500,000	1900	J. & J.	.....	.....
North Chicago City Ry. consol. 4s.	2,500,000	2,500,000	1927	M. & N.	108	.....
West Chicago St. RR. 1st mtg. 5s.	4,100,000	8,969,000	1928	M. & N.	.....	111
West Chicago St. RR. Deben. 6s.	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR. Con. mtg. g. 5s.	12,500,000	6,000,000	1908	.....	106%	107
W. Chicago St. RR. Tunnel. 1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	.....	.....

†Redeemable at option on 60 da. notice.

†Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.

†Subject to call after Oct. 1, 1899, at \$10 and interest.

Assumed by W. Chi. RR. Co., lessee.

Int. guar. by W. Chicago St. RR. Co.

Cincinnati O.

Date of Quotation—Jan 7, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Cin. New & Cov. St. Ry. 1st Con. mtg. g. 5s.	3,000,000	2,500,000	1922	J. & J.	114%	115
Eden Pk In. 1st mtg. 6s.	46,000	46,000	1900	A. & O.	108%	104
Eden Pk In. 1st mtg. 6s.	100,000	100,000	1906	A. & O.	114	.....
Eden Pk In. Cons. mtg. 5s.	581,000	581,000	1906	M. & S.	108%	.....
Cov. & Cin. St. Ry. 1st mtg. 6s.	250,000	250,000	1912	M. & S.	121%	122%
Cov. & Cin. St. Ry. 2d mtg. 6s.	400,000	400,000	1922	J. & J.	182%	187

†Assumed by the Cin. St. Ry. Co.

†\$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Jan 7, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Brooklyn Street RR. Co. 1st mtg. 6s.	600,000	600,000	1908	M. & S.	106%	107
Cin. New & Cov. St. Ry. Cons. mtg. 5s.	8,000,000	2,500,000	1922	J. & J.	118%	114%
Cleveland City Cable Ry. 1st mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105%	106
Columbus (O.) Cent. Ry. 1st mtg. g. 5s.	8,500,000	1,249,000	1918	M. & S.	106	107
East Cleveland RR. 1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	.....	.....
East Cleveland RR. 2d mtg. g. 5s.	1,000,000	1,000,000	1910	M. & S.	107%	.....
Eden Pk In. 1st mtg. 6s.	100,000	100,000	1906	A. & O.	114	.....
Lorain (O.) Street Ry. 1st mtg. 6s.	200,000	200,000	1915	J. & J.	.....	.....
St. Ry. Co. Grand Rapids. 1st mtg. 5s.	600,000	600,000	1912	J. & D.	.....	.....

†\$1,900,000 in escrow to retire bonds of absorbed companies, marked a.

Interest guar. by Cons. St. Ry. Co.

Detroit Mich.

Date of Quotation—Jan 7, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Detroit Citizens' St. Ry. 1st mtg. 5s.	7,000,000	8,885,000	1905	A. & O.	.....	102%
Pt. Wayne & Belle Isle Ry. 1st mtg. 6s.	400,000	877,000	1902	A. & O.	.....	.....
The Detroit Ry. 1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106%

†\$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Jan 7, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
New Haven St. Ry. 1st mtg. g. 5s.	600,000	600,000	1918	M. & S.	111	.....
New Haven (Edgewood Div.) 1st mtg. 5s.	250,000	250,000	1914	J. & D.	111	.....
Windsor Avenue RR. 1st mtg. g. 5s.	100,000	600,000	1912	M. & N.	109	.....
Windsor Avenue RR. Deben. g. 5	10,000	24,000	1912	M. & S.	.....	.....

*With interest. *Unlisted.

New Orleans La.

Date of Quotation—Jan 7, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Canal & Claiborne RR. cons. mtg. 5s	\$150,000	\$150,000	1912	M. & N.	.....	.....
Crescent City RR. 1st mtg. 6s	.....	50,000	1898	M. & N.	106%	.....
Crescent City RR. Cons. mtg. g. 5s	5,000,000	8,000,000	1948	J. & J.	.....	112
New Orleans City RR. 1st mtg. 6s	416,500	899,000	1908	J. & D.	108	112
N. Orleans City & Lake RR. 1st mtg. g. 5s	5,000,000	2,599,500	1948	F. & A.	112	118
N. Orleans & Carrollton RR. 2d mtg. g. 5s	850,000	860,000	1907	J. & J.	.....	.....
Orleans Railroad Co. Cons. mtg. 6s	800,000	800,000	1912	J. & J.	.....	.....
St. Charles St. RR. Co. 1st mtg. 6s.	800,000	75,000	1906	J. & D.	.....	.....

†\$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.

†\$90,000 outstanding.

New York

Date of Quotation—Jan 7, 1900

NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Atlantic Ave. (Brooklyn) Imp. g. 5s.	1,500,000	1,500,000	1984	J. & J.	95	.....
Atlantic Av. (Brooklyn) 1st gen. mtg. 5s.	759,000	759,000	1906	M. & S.	107%	110
Atlantic Av. (Brooklyn) Cons. mtg. 5s.	8,000,000	1,966,000	1981	A. & O.	115	116
Brooklyn & 7th Ave. 1st cons. mtg. 5s.	12,500,000	7,650,000	1948	J. & D.	128	128
Broadway & 7th Ave. 1st cons. mtg. g. 5s.	1,500,000	1,500,000	1904	J. & D.	104	106%
Broadway & 7th Ave. 2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface 1st mtg. 5s.	1,125,000	1,125,000	1924	.....	115	117
Broadway Surface 2d mtg. 5s.	1,000,000	1,000,000	1906	.....	105	106
Brooklyn City RR. Co. 1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown 1st mtg. 5s.	2,000,000	2,000,000	1989	J. & J.	115	116
Brooklyn Bath & W. E. RR. Gen. mtg. 5s.	1,000,000	448,000	1983	J. & J.	101	.....
Brooklyn Heights RR. 1st mtg. 5s.	250,000	250,000	1941	A. & O.	104	.....
Brooklyn, Q's Co. & Sub'n. 1st mtg. 5s.	8,500,000	8,500,000	1941	J. & J.	112	.....
Brooklyn, Q's Co. & Sub'n. 2d mtg. 5s.	4,500,000	2,750,000	1941	M. & N.	107	.....
Brooklyn Rapid Transit 1st cons. 5s.	7,000,000	5,181,000	1945	.....	109%	100%
Bleecker St. & Fulton Ferry RR. 1st mtg. 7s	700,000	700,000	1900	.....	9%	100%
Cent Pk. N. & E. R. RR. 1st cons. mtg. 4s	1,200,000	1,200,000	1902	J. & D.	107	109
Central Croton RR. 1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	.....
Coney Island & Brooklyn RR. 1st mtg. 5s.	800,000	800,000	1908	J. & J.	101	108
Dry Dock, E. B'd'y & B'd'y RR. 1st mtg. 5s.	1,000,000	980,000	1922	J. & D.	117	120
Dry Dock, E. B'd'y & B'd'y RR. 2d mtg. 5s.	100,000	1,100,000	1914	F. & A.	102	105
Eighth Av. RR. Co. Cert. Indeb. 6%	000,000	1,000,000	1914	F. & A.	108	.....
42d St., Man. & St. Nich. Av. 1st mtg. 6s.	1,200,000	1,200,000	1910	M. & S.	116%	117
42d St., Man. & St. Nich. Av. 2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	.....
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1988	M. & S.	124	125
Metropolitan St. Ry. Co. g. m. cl. tr. g. 5s.	12,500,000	12,500,000	1927	F. & A.	120	.....
Second Avenue Ry. Gen. cons. mtg. 5s.	1,600,000	1,600,000	1909	M. & N.	120	121
Second Avenue Ry. Cons. mtg. 5s.	800,000	800,000	1909	J. & J.	108%	109
Steinway Ry. (L. I.) 1st mtg. g. 5s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co. 1st mtg. g. 5s.	850,000	850,000	1919	.....	110%	112%
Third Avenue RR. 1st mtg. 5s.	5,000,000	5,000,000	1987	J. & J.	.....	124%
Twenty-third Street Ry. 1st mtg. g. 5s.	.....	.....	1909	J. & J.	.....	.....
Twenty-third Street Ry. 2d mtg. 6s.	150,000	150,000	1906	J. & J.	108	108
Union (Huckleberry) Ry. 1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A.	112	112
Westchester Electric RR. 1st mtg. 5s.	500,000	500,000	1942	J. & J.	110	114

†\$1,085,000 in escrow to retire gen. mtg. bonds.

†\$4,850,000 in escrow to retire maturing obligations.

†\$552,000 in escrow to retire 1st and 2d mtg. bonds.

†In treasury, \$80,000.

†Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Jan 7, 1900

In treasury, \$80,000.	
! Guar. by Union Ry. Co.	
Toronto Canada.	
<i>Date of Quotation</i> —Jan 7, 1900	
ntreal St. Ry.....1st mtg. 5s.	2,
ronto St. Ry.....1st mtg. g. 4½s.	4,
\$85,000 per m. single track authorized.	
0,000 in escrow to retire 6s due in 1901.	

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bd.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—Jan 7, 1900						
Jefferson Avenue Ry.....1st mtg. 5a.	400,000	400,000	1908	M. & N.	108	108
Lindell Ry. Co.....1st mtg. 5a.	1,500,000	1,500,000	1911	F. & A.	108	109
Missouri R.R. Co.....1st mtg. 5a.	1,000,000	700,000	1916	M. & N.	108	108
Mount City R.R. Co.....1st mtg. 5a.	400,000	200,000	1910	A. & O.	100	103
People's R.R. Co.....1st mtg. 5a.	125,000	125,000	1902	J. & D.	.....	.....
People's R.R. Co.....2d mtg. 7a.	75,000	75,000	1902	M. & N.	.....	.....
People's R.R. Co.....Cons. mtg. 5a.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric.....1st mtg. 5a.	75,000	75,000	1905	J. & J.	100	101
St. Louis R.R. Co.....1st mtg. 5a.	2,000,000	2,000,000	1900	M. & N.	99%	100%
St. Louis & Sub. Ry.....1st mtg. 5a.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5a.	800,000	800,000	.....	.....	80	84
Southern Electric Ry.....Cons. mtg. 5a.	500,000	500,000	1909	M. & N.	108	108
Taylor Avenue St. Ry.....1st mtg. 5a.	500,000	500,000	1912	J. & J.	116	118
Union Depot R.R. Co.....1st cons. mtg. 5a.	1,091,000	1,091,000	1900	A. & O.	100	100%
Union Depot R.R. Co.....Cons. mtg. 5a.	8,500,000	1,787,000	1912	J. & J.	121	122
†Controlled by St. Louis R.R. Co.						
†Controlled by Union Depot R.R. Co.						
†Controlled by Lindell R.R. Co.						
†\$200,000 in escrow to retire 1st & 2d mtgs.						
†\$200,000 in escrow.						
†\$200,000 in escrow to retire 1st mtg. 5a.						
San Francisco Cal.						
Date of Quotation—Dec 1900.						
California St. Cable R.R.....1st mtg. 5a.	1,000,000	900,000	1915	J. & J.	114	117
Ferris & Cliff House Ry.....1st mtg. 5a.	500,000	500,000	1914	M. & N.	.....	117
Geary St. Park & Ocean R.R.....1st mtg. 5a.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. 5a.	8,000,000	8,000,000	1912	J. & J.	120%	.....
Metropolitan Ry. Co.....1st mtg. 5a.	200,000	.....	.....	.....	.....	.....
Omnibus Cable Co.....1st mtg. 5a.	2,000,000	2,000,000	1912	A. & O.	120%	.....
Park & Cliff House R.R.....1st mtg. 5a.	850,000	850,000	1912	J. & J.	105%	107
Park & Ocean R.R.....1st mtg. 5a.	250,000	250,000	1914	J. & J.	115	.....
Powell St. Ry.....1st mtg. 5a.	700,000	700,000	1912	M. & N.	.....	125
Sutter St. Ry. Co.....1st mtg. 5a.	1,000,000	900,000	1912	M. & N.	.....	.....
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Jan 7, 1900						
Belt Ry. Co.....Cons. mtg. 5a.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 5a.	500,000	500,000	1914	A. & O.	125	.....
Washington & Soldiers' Home.....1st mtg. 5a.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan R.R. Co.....Coll. tr. cons. 5a.	500,000	500,000	1901	J. & J.	.....	.....
†\$50,000 in escrow to retire 1st mtg. 5a.						
Miscellaneous.						
Date of Quotation—Jan 7, 1900						
Bridgeport Traction Co.....1st mtg. 5a.	2,000,000	1,688,000	1922	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 5a.	5,000,000	5,548,000	1921	F. & A.	118	.....
Chesapeake & Potomac Tel. Co.....1st cons. mtg. 5a.	4,000,000	5,000,000	1922	M. & N.	104	104
Croftown St. Ry. (Buffalo).....1st mtg. 5a.	8,000,000	3,866,000	1922	M. & N.	112	112
Columbus (O.) St. Ry.....1st cons. 5a.	8,000,000	2,261,000	1922	J. & J.	115	.....
Consolidated Traction (N. J.).....1st mtg. 5a.	15,000,000	15,968,000	1922	J. & D.	111%	111%
Croftown St. Ry. (Colo.).....1st mtg. 5a.	2,000,000	672,000	1922	J. & D.	115	115%
Denver City Cable Ry.....1st mtg. 5a.	4,000,000	8,500,000	1920	J. & J.	20	.....
Denver Con. Tram'y Co.....Cons. m. 5a.	4,000,000	922,000	1922	A. & O.	80	85
Louisville (Ky.) Ry.....1st cons. mtg. 5a.	4,000,000	4,281,000	1920	J. & J.	119	119%
Minneapolis St. Ry.....1st cons. mtg. 5a.	8,000,000	4,050,000	1919	J. & J.	110%	110%
No. Hudson Co. Ry. (N. J.).....Cons. mtg. 5a.	8,000,000	2,878,000	1922	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.).....2d mtg. 5a.	550,000	550,000	1922	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.).....Deb. 5a.	500,000	439,000	1902	F. & A.	.....	.....
Petersen (N. J.) Ry.....Cons. mtg. 5a.	1,250,000	1,000,000	1921	J. & D.	.....	.....
Westchester (N. Y.) Ry.....1st mtg. 5a.	8,000,000	2,000,000	1920	A. & O.	.....	.....
St. Paul City Ry.....Cons. 5a.	5,500,000	4,298,000	1927	.....	105%	106
St. Paul City Ry.....Deb. 5a.	1,000,000	1,000,000	1900	.....	108	.....
†\$21,000,000 in escrow to retire 1st and 2d mtgs. 5a.						
†\$200,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
†\$750,000 in escrow to retire bonds of C. St. R.R. Co.						
†\$27,000 in treasury.						
†\$500,000 reserved to redeem prior liens.						
†\$250,000 in escrow.						

ELECTRIC LIGHT AND ELECTRIC MFG. COOS

Boston, Mass.						
Date of Quotation—Jan 7, 1900						
Delaware Gas Lt. Co.....1st m. 5a. g.	800,000	800,000	.....	J. & J.	108	108
Edison Elec. Illuminating Co., Boston.....	2,026,000	.....	.....	Quar.	187	.....
General Electric Co., gold coup. deb. 5a.	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa.						
Date of Quotation—Jan 7, 1900						
Allegheny County Light Co.....5a.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co., Scrip. 5a.	195,570	.....	.....	M. & N.	.....	.....
Miscellaneous.						
—(Jan 7, 1900.)						
Edison El. Illg. Co. (N. York) 1st m. 5a.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Illg. Co. (N. Y.) con. m. g. 5a.	15,000,000	2,188,000	1922	.....	124	.....
Edison Elec. Illg. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122%	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5a.	2,500,000	.....	1927	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 5a.	5,176,000	.....	1927	A. & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5a.	8,000,000	.....	.....	F. & A.	102%	.....
United Elec. Light & Power Co. (N. Y.).....	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—Jan 7, 1900.						
American Bell Telephone.....4a.	.....	.....	1908	F. & A.	100%	101
Northwestern Telegraph Co.....7a.	.....	.....	.....	.....	.....	.....
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 5a.	.....	.....	.....	.....	114	115
Chesapeake & Potomac Teleph. Co.....5a.	.....	.....	1911	J. & D.	108	108

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—Jan 7, 1900						
American Electric Heating.....7a.	500,000	500,000	.....	.....	.....	.....
Armington & Sims Engine Co.....	.....	.....	.....	.....	.....	25
Barnes & Smith Car Co.....5a.	.....	.....	1922	J. & J.	106	107
Carborundum Mfg Co.....5a.	.....	.....	1922	J. & D.	.....	.....
Washington Pump Co.....	75,000	.....	.....	.....	115	127
Unlisted						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16% @ 16 1/2c.; Lake, 16% @ 17c.; casting, 16% @ 16 1/2c.

The Detroit street railways have been consolidated under the name of the Detroit United Railway Company with a capital of \$12,500,000.

The Connecticut Lighting & Power Company of Waterbury has filed in the State Secretary's office a certificate of increase of capital from \$1,000,000 to \$15,000,000.

All obstacles to the merger of the People's Electric Light & Power Company of Newark, N. J., and the United Electric Company of New Jersey are said to have been removed.

During the fiscal year ended December 31 Philadelphia Electric earned a surplus of \$100,000 over interest charges. This, present year, with reduced interest charges, there should be shown a balance of \$180,000.

An official of the Metropolitan Street Railway Company of New York says he understands that the entire issue of \$7,000,000 worth of stock has been taken by the stockholders at 160, the price at which it was offered.

The Chicago Metropolitan West Side Elevated Railway Company reports for the ten months ended December 31 (December estimated): Gross earnings, \$1,199,974; operating expenses, \$518,040; surplus, \$681,934; total surplus, \$684,916.

A dispatch from Boston states that the control of the Erie Telephone & Telegraph Company has passed from the hands of the Telephone, Telegraph & Cable Company of America to a syndicate represented largely by capitalists of that city.

Manager Emmons of the General Electric Works on January 1 issued the following statement: Number of hands employed December 31, 1900, 7,350; amount of weekly pay roll, \$97,000; net amount of business for the year 1900 about \$27,000,000.

Statements have been made that negotiations are now pending to consolidate the Kingston City Railroad and the Colonial Railroad of Kingston, N. Y. The officials of both roads have refused to confirm the statements at present, although considerable credence is given to the report.

The New York Railroad Commission will give a hearing in Albany on January 25 to the Buffalo, Rochester & Niagara Falls Railroad Company's application for permission to construct an 80-mile trolley railroad, which will practically parallel the New York Central Railroad. Subsequent hearings also will be given along the proposed line's route of construction shortly after the hearing in Albany.

The consolidation of the Boston Electric Light Company and the Edison Illuminating Company is to be effected by the leasing of both companies by a syndicate, represented by J. P. Morgan & Co., upon a rental equal to 10 per cent. on the stocks. The syndicate will form a new organization with a capitalization of \$3,650,000. Stockholders of both companies will be allowed to subscribe for stock in the new company at par.

Much speculation is going on in financial circles generally, says the Philadelphia "Stockholder," as to the future course of Brooklyn Rapid Transit in the market. Some argue that the price of the stock has advanced plenty far enough, while others claim that a much higher level will be established and probably maintained. The latter opinion seems the more reasonable and is shared by those in position to know the company's condition and plans.

The Boston "News Bureau" says: "We understand that the attempt to bull Amalgamated Copper has been abandoned for the time being. The interests which tried to advance the stock have sold some of their holdings and say they are willing to let the remainder stand as investments pending the adjustment of difficulties in Montana. It is supposed that the Montana Legislature will try to enact an eight-hour day in the mines. Whether this will be accepted by mining interests or will result in closing down of mines remains to be seen."

The report that the Raritan Traction Company has secured from the Freeholders of Middlesex County, N. J., the right to extend its lines to New Brunswick has been confirmed. Thus the company obtains connections with the Consolidated Traction Company of New Jersey, and is enabled to run from Perth Amboy to Jersey City by trolley. The Raritan Traction Company is a consolidation of the Perth Amboy Railroad and the Raritan Trolley Company, and is owned by New York capitalists. Leonard Lewisohn is president of the company, C. J. Wittenberg vice-president and J. C. McCoy secretary and treasurer.

A mortgage for \$50,000,000 was filed on Friday in the Westchester County Register's office at White Plains, N. Y. The mortgage is given by the Third Avenue Railroad Company to the Morton Trust Company of New York and covers the following lines: Union Railway Company, Forty-second Street, Manhattanville, St. Nicholas Avenue, Dry Dock, East Broadway & Battery, Kingsbridge, Yonkers, Westchester Electric, Southern Boulevard & Tarrytown, White Plains and Mamaroneck Railways. The instrument is dated May 15, 1900, and is due May 15, 2000. It is said the money raised for this mortgage is for general construction purposes and improvement of the road and its consolidated lines.

A dispatch from Minneapolis states that the gross earnings of the Twin City Rapid Transit Company for December showed an increase of 10.11 per cent. over the corresponding month in 1899. For the fiscal year, which ended December 31, the percentage of increase is 13.62 per cent. The earning capacity since the beginning of 1900 seems to be increasing, for the daily gain over the previous year has averaged \$800. For the three months ended November 30, which are regarded as average months, the surplus over fixed charges and dividends on the preferred stock was \$220,000. If this average is sustained the company should be able to earn a surplus of \$880,000 in the current fiscal year, equal to 5.86 per cent. on the common stock.

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THE TRADE SUPPLIED BY
THE AMERICAN NEWS COMPANY.

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EDITORIAL NOTES.

The Monroe Doctrine in Trade.

The rapid growth of man-
ufactures in the United
States has lately claimed
universal attention and
caused no small amount
of jealousy from the manufacturing centers
of the old world.

An anomaly is noticed in our nation employ-
ing comparatively higher priced labor, and car-
rying her products to Europe and securing
trade at the doors of old established factories
in open competition.

This anomaly is not only very plainly evident
along well established lines of trade, but in
the newer and lately developed lines of work,
this fact is most prominently noticeable, and
to particularize further, the electrical, and its
allied manufacturing industries, above all
others stand pre-eminent in international com-
petition, and we may almost say above this com-
petition, for even the European birth places of
the electrical sciences have been almost uni-
versally invaded by the highly practical and
economically constructed machinery of Ameri-
ca's electrical designers, and in so pronounced
a manner as to leave no doubt at this time in
the minds of the Central and South Americans
and the inhabitants of the West Indies, as to
the desirabilities of our electrical products for
their own countries. The outlying countries
of our own hemisphere are virgin territories
for these newly developed products. They are
the new fields to be developed and being com-
paratively close to our own doors we have an
undeniable advantage for the future. Here
our growing shipping interests are finding a
steady development.

Our export trade has heretofore found its de-
velopment along the parallels of latitude,
henceforth it will be along the lines of longi-
tude. The great prestige secured in the form-
er, will now more rapidly help us in our trade
in the latter direction.

If the Monroe doctrine in international poli-
tics is well recognized, the same doctrine in
trade, with our present facilities, will give us
nearly a commercial monopoly in virtue of
price and quality alone.

The same well directed efforts which have
secured us our present success, will give us an
unassailable position in the Southern countries;
but the difficulties to be encountered in these
new fields are somewhat different, and with

which we have had little experience. The edu-
cated European engineer and trader almost
always knows the English language well
enough for commercial purposes at least, but
our Southern friends must transact their busi-
ness in the Spanish or Portuguese languages;
our manufacturers have not as yet given this
matter the serious attention it demands.

Descriptive matter and price lists, and pre-
ferably also correspondence, should be in Span-
ish to secure merited attention. This is a mat-
ter our commercial German cousins have well
recognized and they have greatly profited there-
by. Their salesmen also are well equipped
with a knowledge of Spanish.

Until quite lately it has been difficult to se-
cure reliable commercial ratings in Southern
countries, which has been a serious difficulty
for our exporters, but the extensive systematic
efforts in this direction are rapidly becoming
reliable and banking facilities are increasing,
while the money system of the United States
is well understood throughout the American
Spanish speaking countries.

We have only to solicit this trade to secure
it, and *ELECTRICITY* through its export edi-
tions now offers its facilities.

* * *

A Submarine System of Wireless Telephony.

In the issue of *ELEC-
TRICITY* of July 26, 1899,
there appeared a de-
scription of an electri-
cal device invented by
an Italian professor,

which had for its object not only the prevent-
ing of collisions between vessels at sea, but the
detection of the approach of torpedo-boats in
naval warfare as well. This invention was
based on the principle of the telephone, a deli-
cate diaphragm being submerged to receive
the sound waves which passed through the
water. Commenting on the device at the time
we stated that it would seem to have great pos-
sibilities provided a sufficiently sensitive dia-
phragm capable of vibrating under water had
been obtained. It now appears that Prof.
Elisha Gray has also been quietly working along
this same line and has only recently perfected
a system of signaling, using the water as the
transmitting medium for which great things
are hoped. Prof. Gray's invention differs con-
siderably from that of the Italian professor.
In practice the former proposes to make use of
a submerged bell, operated electrically. The
bell may be lowered through a well hole in the

boat or it may be suspended from a buoy, in which case it would have to be connected with the source of power by means of a cable. By an ingenious mechanism the bell may be tolled or it may be made to ring any desired number or numbers at the will of the operator, who would thereby be enabled to send intelligible messages, each letter of the alphabet being represented by a given number.

To pick up the water sound waves emanating from such a bell the vibrations coming from the propeller of a torpedo or submarine boat Prof. Gray, in conjunction with Mr. Arthur J. Mundy, has devised a great variety of receivers, operated pneumatically, electrically and mechanically. For comparatively short distances a common ear trumpet screwed to the end of a piece of gas pipe may be made use of, the mouth of the trumpet being submerged and sealed by a tin diaphragm. For greater distances the inventors have constructed an electrical receiver, by means of which the bell has been heard distinctly at a distance of twelve miles. The submerged end of this receiver may be lowered over the side of the ship or attached to it on either side of the bow, under the water-line, like a pair of ears. The submerged part is connected by means of an ordinary telephone receiver, which may be carried to any part of the ship, say the pilot-house, where the navigator can listen for the sound of the bell. Prof. Gray has devised an improvement for the electrical receiver by means of which a large gong will be rung automatically in the pilot-house, or any other part of the ship, whenever the submerged bell is rung. That is to say, the gong rings sympathetically, following the bell, stroke by stroke, there being no connection between them other than the sound waves traveling through the water from the bell to the gong. Thus a bell may be submerged at some dangerous point along a coast and a vessel coming within two or three miles of it will be automatically warned of her danger by the strokes on the gong in the pilot-house.

In a report referring to a test of this system, dated December 31, a number of witnesses say:

"We, the undersigned, hereby certify that we have this day heard the submerged bell (struck electrically from the experimental station on board the Sea Bell) through the electrical receiver (submerged from the deck of a steamer engaged for the purpose), at distances of 1½, 4, 8 and 12 miles in the open sea. At 1½ miles the sound of the bell was heard very loud and very distinctly; at 4 miles the sound was quite as distinct and almost as loud as at 1½ miles; at 8 miles the sound was quite as distinct as at 1½ miles, and almost as loud as at 4 miles; at 12 miles the sound was heard at times quite distinctly and at times somewhat feebly. Even at 12 miles the sound received was sufficient to give a practicable warning signal. The bell was also heard in the forehold of the steamer, without any receiving apparatus whatever, at a distance of one-quarter of a mile so loud that it seemed to be right alongside the ship, and at a distance of 1½ miles it was heard faintly, but unmistakably, in the same position in the hold and without any apparatus for detecting sound."

This statement was signed by Commander Arthur P. Nazro, U. S. N., Prof. Wallace C. Sabine of Harvard University, Prof. William Y. Allen and others.

In Prof. Gray's opinion such an invention should prove of great value to navigators dur-

ing times of heavy fog by enabling them to tell their exact location, providing, of course, that such electrically operated submerged bells were placed at frequent intervals along the coast. The electrical receiver might also be used for detecting the approach of submarine torpedo-boats, whose machinery can be heard throbbing a distance of several miles. Taking it all in all, Prof. Gray's invention would seem to have great possibilities in it as a saver of life and property, and for this reason it is to be hoped the near future will see it given a fair trial on a practical scale at some point along the coast.

* * *

South America as a Market for Our Electrical Machinery.

paratus to the various countries of South America. As every year sees more of American made machinery going to those countries, a careful study of the regulations should be made by manufacturers seeking to extend their trade in that direction.

The amount of electrical goods shipped yearly from the United States to South America is at the present time by no means insignificant, still a little more effort and study of the question by manufacturers in this country would do much toward helping to establish a market and a demand for American made apparatus, that even Germany, at present our greatest rival in those countries, could not overcome.

A fair idea of the amount of business the electrical manufacturers in the United States are at present doing in South America may be gained by a glance at the figures covering the exports of electrical instruments and apparatus for the fiscal year ending June 30, 1900.

Of the various South American countries Argentina heads the list, with a total receipt of \$259,608 as against \$247,062 in 1899; Bolivia follows with a slight increase from \$225 in 1899 to \$724 in 1900; Brazil showing a material increase from \$113,981 to \$222,137; Chili from \$25,622 to \$32,358; Colombia shows a decline in import values under this classification from \$35,011 to \$25,437, but this is nearly counterbalanced by those of Ecuador, which shows an increase from \$10,471 in 1899 to \$18,747 in 1900. Perhaps none of the South American countries show a larger percentage of increase than does British Guiana, the exports jumping from \$4,078 to \$49,447; Dutch Guiana, on the other hand, shows a decrease from \$1,348 to \$80, while French Guiana shows a balance in its favor of \$5 as against nothing for the year previous. No shipments are reported in either year from Paraguay; while those for Peru show an increase from \$14,157 to \$75,353; and of Uruguay from \$4,768 to \$11,563; while Venezuela foots up the list with a remarkable decrease from \$25,271 in 1899 to \$6,478 in 1900. This makes a total for all the South American countries in 1900 of \$701,937 as against \$481,994 in 1899.

Taking similar returns in a more condensed form for the eleven months ending with the 30th of November the showing is that there has been a steady and material increase in these shipments to all South American countries for the past three years from \$331,752 in 1898 to \$547,887 in 1899, and still further to \$712,164 in 1900.

Again taking the returns for the fiscal

years of 1899 and 1900 we find that the total shipments of electrical machinery to South American countries in the former year was \$214,811, whereas in 1900 they show an increase to \$327,342.

Taken by countries, these returns show that the exports to Argentina have increased from \$114,733 to \$215,505; to Brazil, from \$77,777 to \$87,058; a decrease appears in the returns covering the exports to Chili from \$4,568 to \$132; on the other hand, Colombia shows an increase from \$3,039 to \$5,152; Ecuador shows a receipt of \$945 in 1900 as against none in 1899; British Guiana shows a decrease from \$915 to \$125, and Dutch Guiana from \$1,074 to \$519, with no shipments reported for French Guiana in either year, the same holding true for both Bolivia and Paraguay. The exports to Peru show a decrease from \$10,696 to \$8,515. Uruguay shows no receipts as compared with \$739 for the preceding year, while the returns from Venezuela show a jump from \$1,270 in 1899 to \$9,391 for the past fiscal year.

These figures are certainly encouraging, but there is not the slightest doubt but what with a little effort on the part of our manufacturers they could be materially improved upon, especially in view of the fact that most of our Southern neighbors are just beginning to erect electric lighting plants, build trolley roads and run telephone wires.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

THE Governor of the State of Tobasco, Mexico, has issued an order that the telephone systems in that State be at once extended from Chontalpa del Paraiso to Ceiba and Dos Bacos, the last-named town being located on the sea-coast.

THE New York State Electrical Contractors' Association, of which E. F. Lester of Syracuse is president, held its annual meeting in Utica on Tuesday, Jan. 15.

A RESIDENT of Parkersburg, W. Va., is said to have invented a new electrical heating device. By passing a current of electricity through a compound of earth substances an intense heat is generated. The heater itself is inclosed in a globe made either of porcelain or glass.

THE principal industries of Guatemala and the actual commercial affairs of that South American country are dealt with in a report recently issued by the Belgian representative at Guatemala. Among other things he states that the textile industry has made a certain advance as a domestic industry and that electricity is gradually being introduced, the capital and some other towns being lighted by means of the electric current.

At a meeting of the American Society of Mechanical Engineers at 12 West 31st street, New York city, on the evening of January 9, Cornelius Vanderbilt described in detail the locomotive firebox which he invented and which is now being given a trial on the New York Central Railroad.

THE recent experiments with wireless telegraphy in connection with the French fleet have been so satisfactory that it has been decided

to provide the entire Mediterranean squadron with wireless apparatus, which will be subjected to decisive tests during the coming cruise of that squadron. The recent experiments showed that dispatches can be exchanged reliably at distances of from eighteen to twenty miles.

The largest traveling electric crane in New York was put up at the Brooklyn Navy Yard last week. The apparatus has a capacity of forty tons, and there are other cranes on hand ready to be installed, one of twenty-five tons capacity and another of ten tons. In the main department of the machine shop and on the upper girder will run the crane, while on the track below the two ten ton lifting and carrying machines will be placed. The former will cost about \$12,000, while the latter will cost \$8,000 each. The forty ton crane will be used in the erecting department of the shop, where the big engines, boilers and other heavy parts of warships are handled.

A COMPLIMENT is paid to American management by the adoption of a number of features of the American telephone system by the National Telephone Company of Great Britain, which has lines throughout the United Kingdom. It is said that the British Post Office Department, which will compete with the private company this year, will also adopt a large number of American devices, such as underground wires, automatic signaling and metallic circuits.

The city of Buenos Ayres, Argentina, has a population of about 780,000. To supply it with electric light there are four companies. One, la Primitiva, is native born; a second, the River Plate Electric, is of English origin; the third, the Deutsch Ueberseisch, is, as its name denotes, German, and an offshot of the world-ranging Allgemeine. The last, la Compania General, is in spite of its title really French. Nevertheless for its plant it has gone in the main to the Heliös Company of Berlin (but the Allis engines are American, and the water-tube boilers French). Its station, which was opened in the beginning of last year, is now described at great length in the "Elektrotechnische Zeitschrift." It is on the monocyclic system, and if current should be wanted for any of the tramways synchronous motor generators are to be used.

ADVICES from London state that the Pacific Cable Committee has accepted, in behalf of the Governments of Great Britain, New South Wales, Queensland and New Zealand, the bid of the Telegraph Construction and Maintenance Company to make and lay a cable from Vancouver to Queensland and New Zealand, via Fanning, Fiji and Norfolk Islands, for \$8,973,000, the work to be finished at the end of 1902.

OUR Consuls keep harping upon the importance of paying more attention to packing for export. This is one of the most important features to be attended to in getting and securing foreign fields for our products. Nothing is so disappointing as to pull out broken articles ordered when the buyer is looking on, eager to carry away the article or commodity for which he has been watching and waiting for weeks. A little extra amount of excelsior, a few more nails or screws, a little better wood in boxes, a little better binding material, making a very trifling difference in expense, would

do wonders. Then, too, color, kind of articles, popular prejudices, means of transportation, geographical conditions, etc., play far more important parts in this matter than many merchants and manufacturers seem to think. Goods that go into the interior of South America, Asia, or Africa, on pack mules, donkeys or camels, must be packed not only better, but with due consideration of the animals' carrying capacity, than goods going to a seaport. This matter has been too long and too often neglected.

GEN. JUAN LUIS BUERON, of Guatemala, who is known as one of those who accompanied Gen. John C. Fremont on his second hazardous trip across the Rocky Mountains, arrived in the United States for the second time in November, 1900. Gen. Bueron's errand was to interest capitalists in a financial way. He has a concession from his Government for a line of road over the Chuepache Mountains, around the great volcano of Santa Maria, which is 14,000 feet high. There is a road from Champerico to San Felipe, the former being the seaport. From San Felipe the proposed road, which will be a Cremallaire cogwheel line, will ascend 7,000 feet to the summit and go down 1,000 feet to Quesaltenango. The grades will be about 9 per cent., and as there is in the Samala River water power to develop 8,000 horsepower of electricity, that will be the agent used. This will open a rich country, as the high plateaus will, it is said, grow anything that can be found in the Ohio Valley in the United States. There are also many mines in tributary regions.

OUR MANUFACTURING SUPREMACY.

BY JEAN WETMORE.

The foreign commerce of the United States owes its rapid development to a complex number of causes, but fundamentally to the higher average of intelligence among its producers, the result of free schools of a high order and a comprehensive postal system which brings the untrammelled products of the press into the most humble homes.

The United States Government has fostered the intelligence of the people, and their widened understanding and inventive genius have insured the creative power of the nation and given it prestige in international commercial competition.

Our workmen are above being dumb driven cattle; they are heroes in the strife, endowed with quickened mental faculties, which give skill and celerity of movement to their physical efforts. They direct the movements of machinery and through their intelligence they have practically graduated from manual drudgery. The latter has been growing constantly less through the ever increasing applications of still better mechanical aids.

The whole tendency of our growth is toward an increased output, of a better quality at a constantly decreasing cost price, and at the same time a gradual increase in the wages paid for the necessary superior quality of skill and knowledge required by the operators.

Improved machinery has made possible the well established fact that in many instances the lower the cost price of an article, the higher are the wages paid. Accurate, fast working machinery, with high-priced skilled attendance, has given us our commercial prestige. Our liberal patent laws have done much to en-

courage the inventive faculty among practical workmen, to yet further reduce the drudgery element and lower the cost of production.

As a result our productive capacity has gradually increased our wealth and consequently our available working capital, and to-day we are witnessing the rapid development of an element that has heretofore claimed little attention—the immense segregation of capital and skill in each particular industry that makes possible still further reduction in the cost of manufacture through more systematic business methods and a better utilization of the waste or by-products. Many of our manufacturing establishments have receipts from the sale of prepared waste material that formerly cost considerable to dispose of but which now equals the gross income from their staple products itself. These economies are possible only, through the use of the most improved methods and a high grade of scientific skill which only large capital doing business on a grand scale can command. Many of our largest exports at the present time are of this class.

The first century of the republic has been spent in getting ready to do business, by practicing on a trade of a domestic character. The second century of our growth will consist in actually doing a foreign export business which will not be rivaled by any other nation. Much has thus been accomplished but there is much yet to do. We are hampered by a diversity of languages, for which adequate preparations have not been given our young business men.

Our manufacturers have been protected and encouraged by wise laws to promote their rapid growth, but the same wisdom has not been shown in the direction of building up an international merchant marine.

Our commercial rating bureaus are unexcelled, but we have not as yet the same facilities in foreign markets. We are troubled by official red tape in Russia and ignorance in Turkey and China. Our internal preparations have been adequate for a world-wide commercial growth, while our preparations at the other end of the line have not received the attention they merit. We are even ridiculed for our ignorance in packing goods for foreign shipment.

We have the quality of goods the world desires and the prices to secure the trade but we have not at present the proper kind of foreign connection to give us the necessary advice and carry out our superior business methods.

These difficulties are only temporary and incident to our present stage of growth. The fundamental foundations of our commercial supremacy are substantially and wisely laid and the finished superstructure will be rapidly completed.

We have barred competition in our own markets by fostering the intelligence and the inventive genius of our individual workmen and protected our feeble industries until they are now able to make goods better and cheaper than their foreign rivals; our manufacturing trusts with their immense aggregation of capital and skill are now able to utilize every kind of waste product and through comprehensive systems of organization to save the cost of much useless labor, and turn it into productive channels, with the final result that the country now finds itself unable to consume its own products, owing to the great fecundity of its resources.

We now demand wider markets, and these are the reasons why the United States will eventually become during the second century of its existence the dominant and productive commercial power of the earth.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 10.

THE PRINCIPLE OF THE DYNAMO.

In the previous article we described an armature consisting of a single coil of wire connected to two segments for use as a commutator. This was done only to illustrate the principle involved in the induced electrical action, as such an arrangement would not make a practical dynamo for commercial use for a number of reasons; first, because of the unsteadiness or wavy character of the flow of current, and second, because of the high difference of pressure between the two plates which would very much interfere with the commutation of the current. To obviate these difficulties it is necessary that the coils of the armature be evenly and uniformly distributed over its entire surface and connected to commutator plates or segments at equal intervals.

About the first armature of this description that was put to commercial use was invented by a French scientist named Gramme and as a result a particular kind of armature is known to-day as the gramme type, sometimes called ring armature. The core of this type consisted of a ring of fine iron wire. Wound on this iron core was a continuous coil of insulated copper wire connected at equal and frequent intervals to commutator segments each of which was entirely insulated from all the rest.

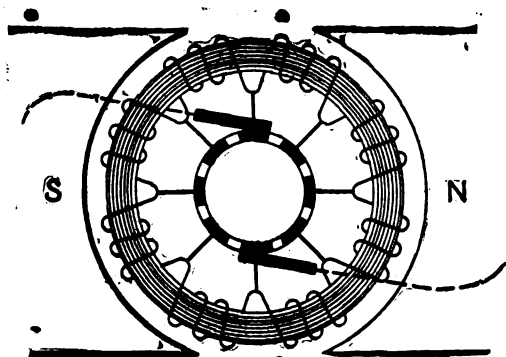


FIG. 1.

Referring to Fig. 1 you will readily see the principle of this type. When this armature is placed in a magnetic field and revolved, the windings or coils which are opposite one pole cut the lines of force in an opposite direction to the coils opposite the other pole. This will induce opposing electrical pressures, which will cause a point at one side of the armature to be of a high electrical pressure of voltage while a point on the other side would be of a corresponding and equally low electrical pressure. If brushes forming the two ends of an external circuit be connected so as to bear on these points then the induced current will flow over the circuit from the high pressure brush to the low pressure one. The path of the current in the armature itself will be from the low pressure point to the high pressure one through both halves of the armature in multiple.

When an armature is wound in this manner the number of coils of wire or conductors op-

posite the pole pieces and cutting the lines of force is practically the same for every position of the armature during a revolution, consequently the induced electrical action will have an even and continuous pressure when it is revolved at a uniform rate of speed.

Commercial gramme or ring armatures as a rule are not wound with a continuous wire but each division is wound as a separate coil and the end of one coil connected at the commutator segments with the beginning of the next coil, etc., making practically one continuous winding which is electrically the same as though made with a single long wire. The advantage of this is that it is much more convenient to construct and also makes it possible to better insulate the different parts of the windings from each other.

As has been said, the core of the gramme armature was made of iron wire coiled up in the form of a ring; however, it does not necessarily follow that this must be so, for a great majority have cores built up of disks which are punched out of sheet iron and insulated from each other by thin tissue paper placed between them. The object to be obtained by dividing the core into disks and insulating them from each other is the prevention of currents being set up in the core itself when it is revolved in

as possible the objectionable features produced by this condition it is essential that the armature cores be made of very soft wrought iron which has been well annealed.

In constructing dynamos there must, necessarily, be a certain amount of non-magnetic space between the iron pole pieces and the iron core of the armature. This is usually called the gap, and as it is not an insulator of magnetism, a certain number of the lines of force set up by the fields will leak around the armature instead of passing through it, causing a proportional waste of energy. In order, therefore, that this leak shall be as low as possible it is essential that the air space, which forms part of the reluctance of the circuit, shall be as small as the operation of the machine will permit.

To get the iron of the armature core as close to the pole pieces of the field as possible the disks of which it is composed are often constructed toothed and the windings are placed in the grooves between the teeth. It might be reasonably supposed that some of the lines of force would leak through the iron in this case without acting on the turns of the wire, thus causing a reduction in the electrical pressure produced by the machine. This assumption would not be correct, however, for it has

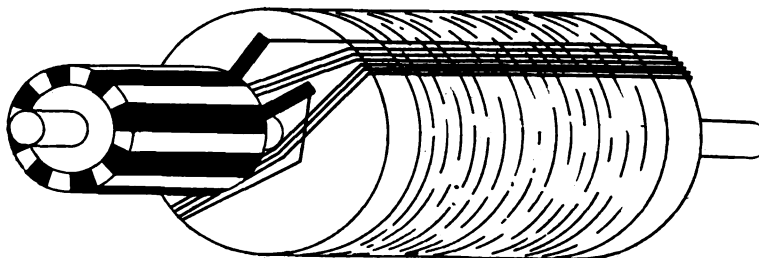


FIG. 2.

a magnetic field. The same principle applies in this that does in the induction coil core and eddy currents will be set up by the action of the lines of force.

These currents tend to flow in armature cores from one end to the other at the surface and returning again near the center of the core. The great objection to permitting currents to circulate in this manner in a core is that it must necessarily take power to keep them in circulation, and also the continual action is productive of heat which may become so intense as to damage the insulation of the coils. By properly laminating the cores these objectionable features may be nearly all prevented while at the same time the passage of the lines of force from one side of the core to the other will not be interfered with whatever.

There is another cause for heating and loss of power in armature cores that cannot be prevented by lamination. This appears to be due to the friction between the molecules of the metal as they are caused to turn over by the attraction of the magnetic field while the armature is revolving. It would appear as if the molecules turned with their magnetism, as the magnetism of the entire core is being governed by the opposite polarities of the fields. While this action is going on a certain amount of power is being used and converted into heat. This effect is called hysteresis, and the amount of heat produced and power wasted in a core on account of it depends upon the quality of the iron, upon the amount of iron in the core, the density of the magnetism and the number of revolutions per minute. To prevent as far

been demonstrated that an armature thus constructed will give just the same electrical pressure when revolved in a magnetic field as one with a corresponding number of conductors wound on the surface when revolved at the same speed under the same conditions.

An armature may also be constructed in the shape of a drum instead of in the form of a ring and in which case all the windings would be on the surface. This type is called Siemens or drum armatures.

The form of winding is given in Fig. 2, which represents a drum armature with one coil wound on and connected. Armatures of this style usually have from thirty to one hundred coils, dependent, of course, on the design of the machine and the purpose for which it is intended.

The manner in which the field coils of a dynamo are connected will depend upon the use for which the machine may be constructed, but in a simple type where the voltage is supposed to remain constant they are connected across the circuit in multiple with the armature. After a dynamo has once been operated there will remain in the iron of the fields a certain amount of magnetism called residual magnetism, which will be sufficient to induce electrical action when the machine is started. The condition will then quickly grow in strength until its normal amount is reached.

The question might here be asked What is the reason for a great amount of power being required to revolve the armature, and why the amount of power required is governed by the output of the machine? This can be answered

by referring to Article 8, where is explained the laws governing the action of the induction coil. This same law holds good in the dynamo, which is that the tendency of the field produced by the induced electrical action is to oppose the inducing field, and of course the strength of that opposition will depend on the strength of the field produced by the induced currents which, in turn, is governed by

ELECTRICITY AT THE PAN-AMERICAN EXPOSITION.

BY ELBERT L. LEWIS.

The purpose of the management of the Pan-American Exposition at Buffalo to make its electrical display the dominant feature of the great show and unexampled in importance is worthy of the time and the place. Wonderful

Power Company, which has harnessed the greatest water-power in the world, and at present has a visible supply of 55,000 horse power, with a like amount being rapidly developed, the opportunity to carry out the splendid idea is an exceptional one. The power of Niagara, sent into the Exposition grounds by means of electric cables, will turn the countless wheels and drive machinery of every description, fur-



ELECTRIC TOWER AT THE PAN-AMERICAN EXPOSITION.

the amount of induced current being used from the machine which must flow through the armature.

Article No. 11 will be entitled "Motors."

The owner of every electric motor in use in Argentina is obliged to pay a national annual tax of \$15.

as have been the discoveries of electrical science in the latter years of the century just closed it is confidently predicted that they will be dwarfed by the developments in the same sphere in the early years of the new century, and therefore the subject is of extraordinary world-interest. Situated within twenty miles of the perfect power-plant of the Niagara Falls

nish power for electric carriages, cars and boats and illuminate the City of Palaces by night.

The Exposition will have an Electricity Building and an Electric Tower and manifold electrical features. Satisfactory progress is being made with the work of construction, and when the gates open on the first of next May

everything will be in readiness for the incomparable electrical display planned.

The Electricity Building is practically completed. It lacks only the finishing touches, in the interior principally, to make it ready for exhibits. It has been wired throughout for lighting and thousands of electric lamps have been installed inside and out. The beauty of this building challenges the admiration of all visitors to the Exposition grounds. The architecture is a free treatment of the Spanish Renaissance. The outside walls are covered with staff, intricate in design and artistically colored, and at the entrances and upon domes and towers are statuary and modeled groups. It is situated in the northwestern part of the grounds. The south facade fronts the Mall



and the north fronts the Midway. The east end is toward the Electric Tower, while the west faces the Grand Canal. The openings of the pergola-like loggias, placed at frequent intervals, present a delightful effect, showing more and more of the details of the pilasters and openings as the eye travels to the end of the building farthest away from the observer.

There is a pleasing ending at each corner of the structure with a low-domed pavilion tower, and the facade is interrupted at the center by a double-towered entrance. This entrance, wide and high, is spanned by an ornamental arch and supported on each side by columns. The towers, also, have minor entrances through them.

The connecting work between the towers, the towers themselves, the pavilions at the corners of the building and similar places are to be brilliantly illuminated and made gay with banners and flags.

The horticultural and floral embellishment of the grounds about the building is very fine.

The Electricity Building covers an area of 75,000 square feet, being 500 feet long from east to west and 150 feet wide. The incorporation of architectural features to make the building conform to the general architectural setting of the group has given much space for promenades, etc., and left approximately 25,000 square feet of space for exhibit purposes. On account of the great interest taken by the general public in electrical science, engineering and invention, and consequently the anticipated attraction of large numbers of Exposition visitors to the Electricity Building the aisles have been made very wide. The main longitudinal aisle is 15 feet wide and the side ones 12 feet wide.

In the northwest corner of the building will be what is known as the Niagara Falls transformer plant, with a capacity of 5,000 horse power. This plant will consist of nineteen 250 kilowatt air-blast transformers, the purpose of which is to transform power from Niagara Falls, delivered at 11,000 volts for distribution about the grounds. Smaller transformers will be used at various points about the Exposition for changing this pressure of

1,800 volts to 103 volts for the operation of lights and other electrical Exposition accessories. All the latest devices for the handling of high pressure electric power will be shown on a complete switchboard, which will be installed in this section, and the various circuits emanating from the Electricity Building will be controlled by a low pressure switchboard. A sub or transformer-station will also be demonstrated in this division.

The progress in the development and application of the various branches of electrical science and industry of recent years makes the exhibit at the Pan-American Exposition of the utmost importance and interest. It will comprehend the entire broad field. The utilization of electricity in various forms of manufacturing industries will be illustrated. This utilization of electricity is destined to be one of the greatest of its fields, and the Niagara Frontier is now an object-lesson in this respect, for the development of Niagara power is almost every day drawing new industries to that region because the proximity and the availability of this power render the manufacturing opportunities so exceptional.

The aim will be to make the electrical exhibit in the Electricity Building a collective one rather than one composed exclusively of individual commercial exhibits. The exhibit will be divided into two groups:

1st. The collective exhibit, which will consist of retrospective exhibits of historical interest illustrating models, or practical contrasts showing the advances in the art.

2nd. The commercial exhibit, composed



of those exhibits possessing distinctive merit whether this consists in workmanship, novelties or useful applications.

As a whole the exhibits in this building will be both attractive and educational in a degree not before realized at any exposition held upon the American continent. They will serve to excite popular interest and in this way to stimulate more general study of this great field of science and a wider intelligence will thus be created upon the subject of the mysterious force known as electricity and its wonderful value to mankind in its application to industrial pursuits.

Directly across the Mall from the Electricity Building is the Machinery and Transportation Building, which is also practically completed. It is similar in appearance, but larger, being

500 by 350 feet in dimensions. Its illumination at night some time back afforded a magnificent spectacle for thousands of curious people, and gave a good idea of the effect to be produced by the illumination of the Electricity Building. Visitors may readily pass from one to the other of these buildings and make comparisons between the closely allied apparatus contained in the two.

The Electric Tower has nearly reached its full height of 391 feet, only the statue of the



Goddess of Light being needed to be placed in position to reach that altitude. The framework is up and the staff is being put on the walls of the main body of the structure, which is 80 feet square up to a height of 200 feet. The colonnades flanking the tower on the east and west and forming a semicircle 200 feet across are also rapidly nearing completion.

The arrangements for the Electrical Fountain effects are going on satisfactorily. The switchboard, by means of which lights of rainbow hues will be thrown upon the fountains has been installed. The fountain display will require 35,000 gallons of water per minute, a much greater quantity than has ever been used for a similar purpose at an exposition. Some of the jets in the Court of Fountains will be 50 feet high. The basin of this Court is 565 by 225 feet in dimensions, which equals 98,872 square feet. Under its waters will be placed 94 large seachlights to cast colored lights on the fountains and cascades and heighten the beauty of the electric and hydraulic effects. The cascade falling from the Electric Tower into the grand basin will be 70 feet high and 30 feet wide.

The courts to be illuminated contain 1,390,000 square feet of space, an area two and one-half times greater than that of the courts at the Columbian Exposition, twice the area of those at the Paris Exposition, and thrice those at the Trans-Mississippi Exposition at Omaha.

Scores of ornamental lamp-posts, each of which will support 25 electric lamps, have been set in the courts and other parts of the grounds.

In the grand illumination about the court of Fountains, Electric Tower, Esplanade and Plaza, 200,000 incandescent lamps will be used. The installation requires 400 miles of wire, weighing about 250 tons.

The Thompson Aerio-Cycle, which will carry passengers to an altitude of 275 feet, in cars hanging in revolving wheels fixed at either end of a steel beam, the middle of which rests upon a steel column and has the play of the "seesaw" or "teeter" of boyhood, will be operated by Niagara Falls electric power and lighted by 2,000 electric lamps. The lights will be of changeable color, adding considerably to the effect of the illumination of the courts and buildings.

The many thousands of lights on the Midway will be additional to the 200,000 used elsewhere in the grounds.

The plant of the Niagara Falls Power Company at Niagara Falls will supply 5,000 electrical horse-power, and as much more will be generated on the grounds, for the purposes of the Exposition. The service arranged for contemplates the utilization of the water power of Niagara, the use of gasoline for motive power, of gas, both under boilers, producing steam, and in gas engines, producing energy; thus giving the Pan-American the greatest variety of sources of power ever enjoyed by any exposition.

The electric launches which will be run in the fine system of canals in the Exposition grounds are being built in New York, and are nearly ready for shipment. They are of the latest pattern and very handsome. They will be transported by special train from the metropolis to the grounds.

Complete, unique and instructive as the electrical display at the Pan-American will be, it must, as a matter of course, attract all persons interested in the development of the newest science.

WATER LOADS FOR ELECTRICITY WORKS*

BY W. E. WARRILOW.

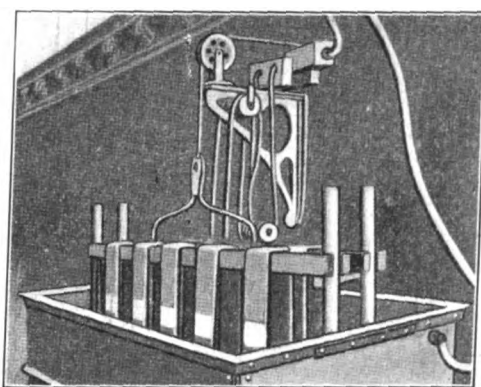
In the early days of electric lighting, when small units were commonly employed, the reliability of the plant was generally accepted, after its preliminary trials by the builders and at the works on its own foundations. After settling down to regular running, the few repairs necessary were effected, and the plant was again given its usual work without testing on an artificial load, though no doubt it would be run round "light" for a short time. Apart from this, no other test would be applied, the machine being "chanced" on the lights when it was considered in a fit condition to take up regular running. This may seem a risky course to pursue, but the particular circumstances would merit it. The size of the unit was conducive to general satisfactory running, and when breakdowns did occur the spare set could be gotten up to speed almost immediately, so that the lights would hardly be out. Consequently, when all things are considered, the engineer was almost justified in putting his machinery, which had been repaired, on the mains without previous load tests.

The growth of the electrical industry, however, has changed the whole aspect of affairs, so much so that the altered conditions bring in their train difficulties which must be met and overcome. Experience has shown that small units are no longer economical when repeated in great numbers to meet the increasing demand, consequently the size of generat-

*From the "Electrical Review," London.

ing units has of recent years been going up by leaps and bounds. Whether the limits have yet been reached it is impossible, of course, to say, but it is nevertheless true that units ranging from 500 to 1,500 kw. are being laid down yearly. The concentration of so much power in one unit is a serious matter, as such a number of lights are dependent on the satisfactory running of one machine, and the consequences of breakdown are by no means pleasant for the consumer. Extra precautions are therefore necessary to ensure the reliable running of the plant when such dire results are attendant on its failure. The size of the unit, moreover, brings with it certain unavoidable features. It cannot be gotten up to speed at a moment's notice, the engine taking perhaps four or five minutes to attain its normal number of revolutions, and where it has been necessary to shut another plant down on account of sudden mechanical or electrical failure, every moment is precious. When machines are running in parallel the withdrawal of the faulty unit may necessitate the opening of a circuit if the remaining sets cannot maintain the normal voltage, and on this occasion the tardiness of the large unit in attaining synchronism will be painfully evident.

The maintenance of large electric light engines in thorough repair is no small matter,



WATER RESISTANCE ON ROOF OF BOILER HOUSE.

and one from which the element of chance should be almost, if not entirely absent. Repairs to brasses and reciprocating parts generally should be followed by tests which can leave no doubt in the mind of the engineer as to the fitness of the plant to resume its regular work. Allowance can, of course, be made for unforeseen circumstances, but every opportunity should be taken of those means which can make "assurance doubly sure." The tests referred to are of the electrical order, and are carried out on an adjustable load provided for the dynamo. This usually takes the shape of a water resistance, which, though well known, is seldom erected as a permanency on the works. When new generating sets are put down, the trials are run on resistances of a temporary nature provided by the contractor for the plant, and removed by him at the conclusion of the trials.

There are, of course, several firms who can supply an artificial load to deal with machines of any capacity, but their prices are prohibitive. It is, however, possible to manufacture the apparatus at the works, and the following lines describe a "home made" resistance constructed at small cost. No novelty is claimed for its principle, though its utility and satisfactory working may sanction its description.

The accompanying half tone and diagrams will give a general idea of the construction and position of the apparatus. The resistance of water is made use of by suspending lead plates, connected to one pole of the circuit, in the water, while the other pole (or conductor) is connected to the tank, containing the water.

Referring to the diagram the tank A, containing the water is fitted with inlet close to the bottom, and overflow may be allowed to pass over the top of the tank; B B are wrought-iron pipes screwed into castings bolted to the inside ends of the tank, and these pipes act as guides to the beams C C, which are fitted with a number of lead plates or strips, D D, bent to drop over and rest on the beams. The two beams are held apart by distance pieces E E, having holes drilled in them for the reception of the supporting iron, F, this latter being shaped with a loop for the raising and lowering wire. The wire is not fastened direct to the iron, but round a bolt passing through a thong of leather laminations. This serves the double purpose of providing a flexible support to the beams and insulating the wire from currents which may lead to the rod. The wire passes over the pulley, G, fixed to the bracket, H, which is firmly bolted to the wall. A hole in the wall admits of the passage of the wire into the engine room, where it is brought over pulleys (suitably placed) to the raising and lowering screw, shown by Fig. 2. The adjustment is carried out by means of a large wooden handle, which is free to turn in a recess in the wall cut for the purpose. The wire is fastened to the end of a pipe in which the screw works, the pipe being prevented from turning by a screw which projects into a slot cut in the pipe. A small pointer fastened to the lower end of the pipe makes the adjustment to exact requirements an easy matter, a scale marked out in amperes or kilowatts being painted on the base of the arrangement. When the adjusting screw can be placed quite close to the switch gear the scale is not necessary, as adjustments can be made with a minimum of trouble, but where the screw is more easily placed on the opposite side of the engine room to the switchboard the convenience of the scale will become evident. The dimensions of the tank are given in the diagram, so that other parts will appear in proportion, but in the construction of another such arrangement the particular circumstances will call for slight alteration.

The arrangement in question, which has recently been erected in a large alternating current station in the Midlands, is fixed on the roof of the boiler house, the supports for the tank being fixed in the engine house wall. The position is an excellent one, as complete isolation during working is easily effected, and the overflow from the tank is carried away without expensive piping arrangements, the rain-water spouting doing all that is necessary. Extra precautions are needed to ensure the confinement of high pressure currents, but these present no difficulties that cannot be surmounted. The flexible cables carrying current to the moving lead plates require the greatest amount of care, though a satisfactory arrangement of these is no hard matter. The half-tone will make clear the disposition of the joint box and cables. Suffice it to say that the main from the switchboard is a concentric lead covered one, and the box is arranged with fittings for bifurcating.

The load tests carried out on the resistance prove its capabilities very well. A 600 kw. al-

ternator has been run at full load quite successfully on the tank without any boiling of the water, the circulation being maintained through the test. The lead plates in this case were only one-quarter immersed, so that when the distance to be traversed is considered, 1,800 kw. may be successfully dealt with by the tank. The arrangement has not been tested for arcing through the water or across the atmosphere moistened by the steam from the water, but as no signs of such occurrences have yet become evident, their possibilities may be left undiscussed. At the same time, every precaution for insulation has been taken.

The distance between the lead plates and the tank sides is the same all round, the load adjustment being effected by reduction of the distance between the plates and the tank bottom. Should the wire or leather thong break,

TRAIN LIGHTING.

At the International Railway Congress at Paris two reports were presented upon the subject of train lighting, which were referred to briefly in the columns of *ELECTRICITY* some weeks ago. These reports by MM. Chaperon and Herard and M. Banovits, respectively, were so interesting that a request has reached this office asking for further details. As already stated, report No. 1, or that of MM. Chaperon and Herard, deals exclusively with the systems of train lighting in vogue in the principal countries of the Continent and in Great Britain, while report No. 2, by M. Banovits, deals with the lighting systems in use in the railways of Austria-Hungary, the Netherlands, Roumania and Germany. The Chaperon and Herard report says:

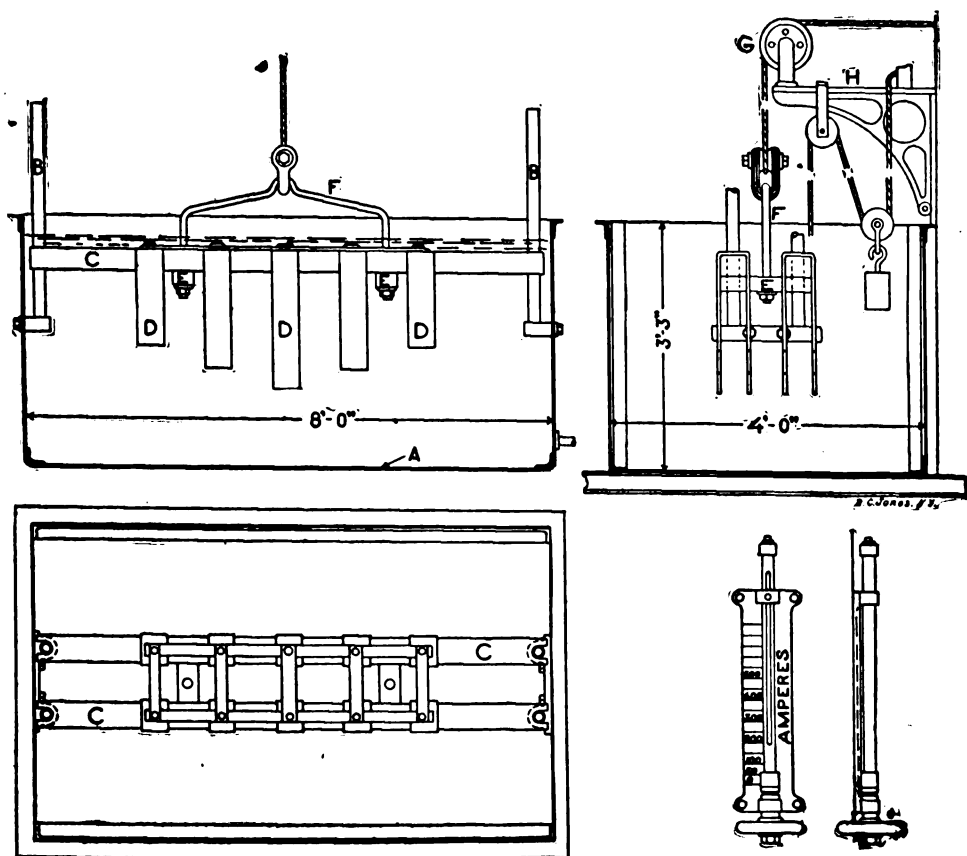


FIG. 1.

FIG. 2.

the plates could not reach the bottom of the tank by reason of the stops afforded by the brackets supporting the guide tubes. The above devices seem to make every allowance for apparent possibilities of accident, so that omitting the unforeseen, the arrangement should work satisfactorily for all time.

The chief item of expense is the tank, which will cost about £20, and the other items, excluding the cable from the switch gear, will bring the price up to £30 or £35, a figure which will compare very favorably with the prices quoted by manufacturers. The cost of the cable, which should be of the best (the use of old material is never to be commended), will vary with the distance between tank and switch gear, but £45 to £50 will be an average figure.

All things considered, then, there is no reason why large units should be run with any doubt as to their reliability after repair, as at small cost a satisfactory testing arrangement can be erected which will well repay the time and money expended on it.

"The railway companies have aimed at a result, if not perfect, at least very satisfactory, by different methods, either in perfecting the apparatus for using oil or petroleum, or in multiplying their number—or by recourse to new and altogether different systems, viz., gas or electricity. With oil lighting the expense of installation is comparatively low, but it requires a numerous staff for cleaning, filling and maintaining the lamps. It is requisite that this work should be carefully done, as the quality of the light and the economy of the system depend absolutely on the manner in which it is done; finally, the quality of oil, wicks, etc., have first importance. All these necessary conditions required in good oil or petroleum lighting bring the cost per lamp-hour to quite a high figure.

"In gas lighting the cost of installation for the manufacture and supply of the gas is quite considerable. The expense for labor is reduced to the minimum, the services of the staff being limited to wiping the cups and chimneys of the lamps, the examination of the burners

and supplying the reserves or tanks of the carriages. The advantages of the system are principally in the quality of the lights, the facility of modifying the intensity as well as the simplicity of the labor in maintenance and cleaning and in the activity in filling the supply tanks.

"The lighting power of the gas may be still improved by mixing it with highly carbureted products. Several of these have been made use of, among others naphthaline (albo-carbon), which has not given very good results; acetylene mixed with gas in the proportion of 25 to 30 per cent gives the flame a very considerable intensity and fixity.

"Electric lighting is, without contradiction, that which is presented under the most attractive form. Incandescent electric lamps have, in fact, an incontestable superiority over all the other methods of lighting, as much from the point of view of comfort as that of facility of installation of luminous centers, which may be as intense as desired and which can be placed at the most convenient points for the passengers. They produce no, or next to no heat, and there is no occasion to provide for the products of combustion being carried outside. The electric lighting of the carriages produced by means of a dynamo driven by the axle during the run of the train realizes, in principle, a complete and rational system of lighting."

In concluding, the authors express the hope that the discussion will be the means of eliciting the information as to whether the car axle lighting system would be likely to deteriorate after a limited use.

M. Banovits, after reviewing the history of train lighting by means of candles, primitive oil lamps, acetylene, etc., says:

"In fact it cannot be concealed that between the methods of lighting by candle and oil on the one side and electric lighting and mixed gas lighting on the other, the difference is immense. The luminous intensity which has been secured (and which may yet be surpassed by these two last methods of lighting) is such that it unites perfectly all the requirements, and finally electricity presents a complete security against dangers of fire and explosion."

Continuing the report says:

"Electric lighting has for itself the immense advantage of perfect security against the dangers of fire and explosion. This advantage compensates largely for all the inconveniences in the system—in fact to-day in any instance of a particularly delicate nature, such as in the trains of the royal families, the transportation of objects of great value, etc., preference is rightfully given to electric lighting.

"If in the special cases we have just enumerated, the taking into consideration of the greatest security is justified, it is proper to examine also into the question of running if it would not also be proper to take it into account from the general view of the passenger service. It cannot be denied that in spite of all the precautions taken by the railway managements, it is scarcely possible to arrive at absolute security against railway accidents. The possibility of such accidents being granted, it requires only the combination of unfavorable circumstances that the catastrophe should be of the largest proportions.

"Finally it should be noted that the method of electric lighting generally made use of—by storage batteries exclusively—is not the only

method of applying this light. It is not denied that the experiments actually in course of trial by some of the lines of the German Union system, either by means of a moving vehicle producing the current for the whole train, or by the production of the current required for each particular carriage, partly by a dynamo driven by the motion of the carriage itself, and partly by storage batteries—may be crowned with success; nor that the results obtained either under the item of expense as under that of simplification of the maintenance, may be more favorable than those realized in the exclusive use of storage batteries upon a large scale, that is to say, under normal conditions."

M. Banovits concludes as follows:

"Of all the modes of lighting adopted up to the present time for the lighting of trains, that which seems to us to answer the best to the conditions of a perfect light is electric lighting, for besides offering the greatest security against the danger of fire, it possesses a proper luminous intensity, assures a light, clean, fixed, exempt from atmospheric influences, and permits a simple and economical dimming for the night. This mode of lighting has moreover the advantage of a simple maintenance and as soon as its application is made upon a large scale, a service will be assured by proper installations, which will be regular and rapid, even in cases of the densest train movement. Everything in short invites to the belief that from the pecuniary point of view this method of lighting will permit more favorable economical results than have hitherto been attained; and under this head it may pertinently be remarked that the advantages which at the moment other methods of lighting may appear to present over electric lighting are largely offset by the superiority of safety conditions and by the other inherent advantages of the method."

The first report in a table giving the number of cars lighted by electricity in the principal countries, states that the United States has 74. There must surely be some error in this figure, as the Santa Fé road, besides several others, have been lighting a number of their cars by means of axle driven dynamos, combined with storage batteries, with both economy and success.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended January 9:

Australia, 72 cases, \$2,026; Barcelona, 3 cases, \$107; Belfast, 8 packages cables, \$2,118; Bolivia, 1 case, \$43; Brazil, 21 packages, \$665; 4 packages railroad material, \$601; 1,000 feet of cables, \$210; British East Indies, 58 packages, \$540; British Possessions in Africa, 49 cases, \$4,039; British West Indies, 12 packages, \$455; Central America, 58 packages, \$791; Chili, 88 cases, \$2,571; Christiania, 18 cases, \$227; Cuba, 52 cases, \$1,852; Havre, 20 cases, \$1,177; Hayti, 3 cases, \$41; Liverpool, 157 packages, \$8,218; London, 91 packages, \$17,743; 19 cases motor vehicles, \$22,367; 15 reels cables, \$5,500; Manchester, 193 packages, \$19,709; Marseilles, 46 cases, \$3,370; Mexico, 36 cases, \$983; New Zealand, 2 cases, \$51; Peru, 10 packages, \$641; Porto Rico, 36 packages, \$2,336; Ramsgate, 24 cases, \$2,000; Reval, 7 packages, \$590; Santo Domingo, 4 cases, \$41; St. Petersburg, 1 motor carriage, \$640; U. S. Colombia, 114 packages, \$780.

IV.—HIGH TENSION POWER TRANSMISSION PLANTS IN FRANCE.

BY FRANK C. PERKINS.

Lancey Monophase Plant in the Valley of Gresivanden.

In the Valley of Gresivanden along the River Isere, there are many little villages of more to less importance, and all of them are now illuminated by electric lights, and a

rectly coupled to a high pressure turbine in the same room. One of the turbines has a capacity of 300 horse power and the other has an output of 500 horse power. The alternators are of the stationary armature type with revolving fields. They were designed by M. Labour of the Société L'Eclairage Electrique of Paris. The armatures are so arranged as to be movable to the right or left on the bed plate, leaving the field magnets exposed for repairs if found necessary.

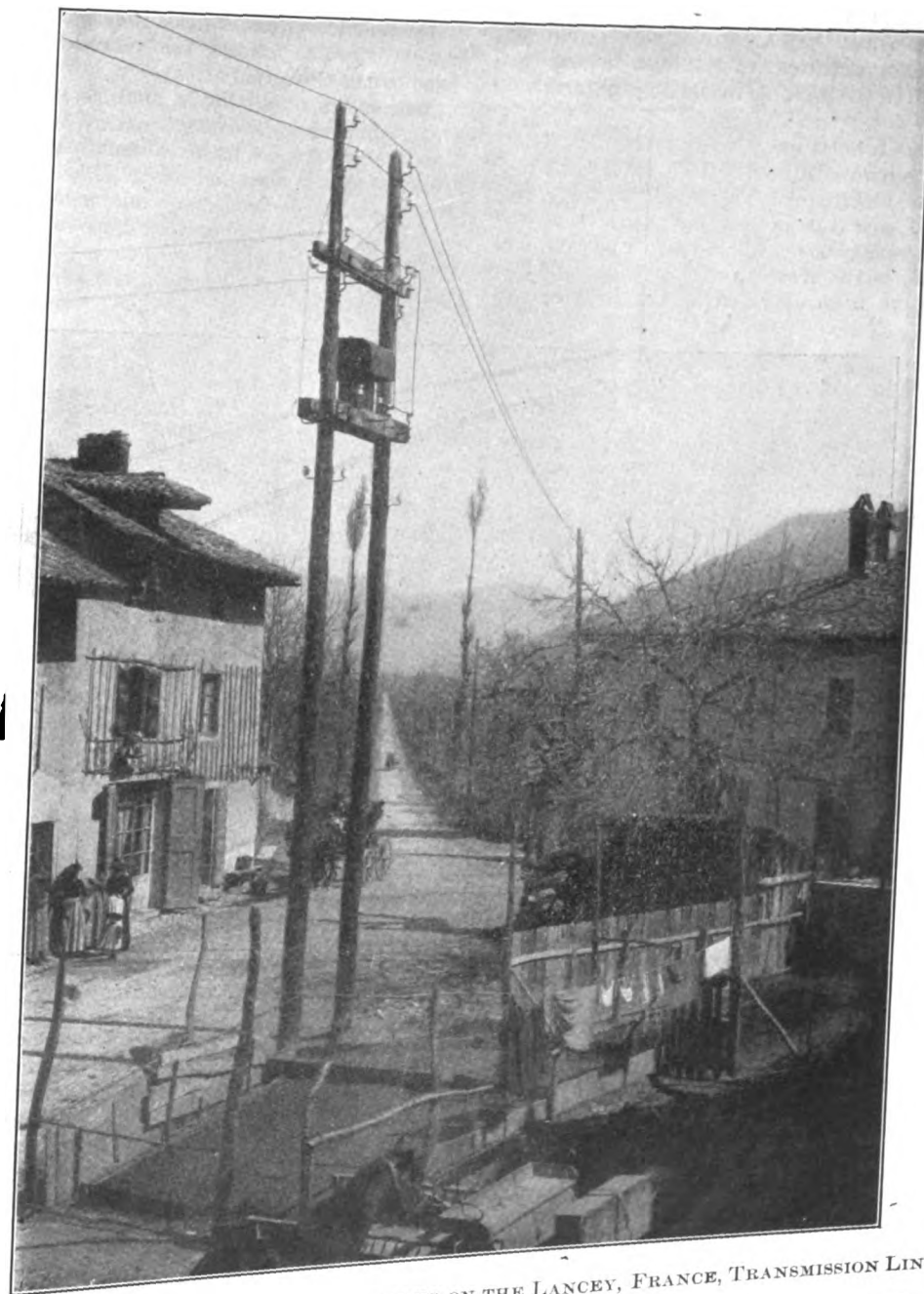


FIG. 8—12,000-VOLT STEP-DOWN TRANSFORMER ON THE LANCEY, FRANCE, TRANSMISSION LINE.

number of the small factories are operated by small motors which receive their supply of power from the energy of the river running along their beautiful valley near by. There are thirty-five of these little hamlets along the transmission line (Fig. 8) extending more than 30 kilometers to the power house which is located at Lancey. The potential on the transmission line (Fig. 8.) is 12,000 volts and the current is reduced in pressure by the step-down transformer to 110 volts, for use in the village.

The power house is equipped with two monophase machines (Fig. 9), each of which is di-

The direct current for exciting the fields of the alternators is supplied from a small continuous current dynamo, seen in the foreground in the accompanying illustration, Fig. 9, and is driven by a belt from the shaft of the direct-connected turbine and generator.

In addition to the 30,000 volt, alternator exhibited by this firm at the Paris Exposition, a 1,200 kilowatt three-phase generator was shown and was of considerable merit. This machine generated a current of 3,000 volts potential and operated at a frequency of 50 cycles per second. It was direct connected to a Dujardin tandem compound engine. The field magnets

of this machine were of the revolving type, and acted as the fly wheel for the engine. The external diameter of the generator was 5.6 meters; 100,000 volts was the high potential which was developed at the Exposition by the engineers of this firm in their experiments with an M. d'Arsonval high tension transformer.

There is little hope that these high potentials can be successfully used in practice on any transmission line for actual power and lighting plants. The difficulties met with in properly insulating a transmission circuit for such high pressures are well nigh insurmountable with the present insulating materials in use.

There is little question but that the 30,000 volts generated directly from the Labour high tension alternator is near the limit for practical use, and it is in but few places that such voltages may be considered safe and practical.

Some of the Western power plants in America have been operated at these high poten-

DUTIES ON ELECTRICAL GOODS TO SOUTH AMERICA

Requirements to be Followed in Shipping Electrical Apparatus to the Various Countries.

ARGENTINA.

There are no restrictions as to the marking of packages intended for the Argentine Republic, but each package, etc., must bear an individual number, each differing from the other. All measurements and weights must be given in the metric system. The duties for electrical goods are as follows, the valuation being fixed by the Government:

Accessories of all kinds, such as switches, fusible interceptors, contact-makers, interrupters or alarm-keys, buttons, commutators of all kinds, shapes and systems, with porcelain base and covers, 25 per cent. ad valorem on valuation of 52.8c per kilogram; the same with porcelain base and metal cover, 25 per cent. on value of 85.4c per kilogram; the same with

flexible cords, with two or more conductors, or copper, spiral-shaped, of any diameter, covered with cotton, mohair, wool, or other materials, 25 per cent. on valuation of \$1.92 per kilogram; the same covered with silk, 25 per cent. on valuation of \$2.88.

Morse's telegraphic apparatus, 25 per cent. on valuation of \$17.28 each; the same without clockwork, 25 per cent. on valuation of \$8.64 each.

Sheaths or tubes of porcelain, 25 per cent. on valuation of 1.15c per kilogram.

Knobs, wooden, common, for electric bells, 25 per cent. on valuation of 38.4c per dozen; the same, pear-shaped and other kinds, 25 per cent. on valuation of 76c per dozen.

Electric bells, 25 per cent. on valuation of 48c each.

Carbons for arc-lamps, 25 per cent. on valuation of 1.44c per kilogram, gross weight.

Ebonite, in sheets, 25 per cent. on valuation of \$1.15 per kilogram; same in tubes or bars, 25 per cent. on valuation of \$1.50 per kilogram.

Vulcanized fiber in sheets, 25 per cent. on valuation of 48c per kilogram; same in tubes or bars, 25 per cent. on value of 96c per kilogram.

Portable galvanometers, 25 per cent. on valuation of \$3.84 each.

Voltaic arc-lamps or regulators and their accessories, such as corresponding fittings and globes, up to 60 centimeters in height, 25 per cent. on valuation of \$11.52 each; same from 60 centimeters to 1 meter, 25 per cent. on valuation of \$17.28 each; same, more than 1 meter, 25 per cent. on valuation of \$25 each.

Voltaic arc-lamps, incandescent, 25 per cent. on valuation of \$2.68 per dozen.

Metals or elements of metals for batteries, 25 per cent. on valuation of 14c per kilogram.

Electric motors for ventilators, 25 per cent. on valuation of \$9.68 each.

Hooks or iron for insulators, 25 per cent. on valuation of 11.5c per kilogram.

Porous jars, charged for batteries, 25 per cent. on valuation of 11.5c per kilogram, gross weight.

Supports for electric lamps, of falence or of falence and bronze, 25 per cent. on a valuation of 43c per kilogram; the same with bronze claws, sockets and connections, 25 per cent. on valuation of \$1.44 each.

Telephones, without bobbin, 25 per cent. on valuation of \$2.88 each; same with bobbin, 25 per cent. on valuation of \$3.84 each; same magnet, 25 per cent. on valuation of \$6.72 each.

Insulating tubes, of Bergman's system with their accessories, such as elbows, sockets, derivation boxes, etc., not coppered, 25 per cent. on valuation of 28.8c per kilogram; same coppered, 25 per cent. on valuation of 38.4c per kilogram.

Jars of earthenware for batteries and accumulators of any form and size, 25 per cent. on valuation of .067c per kilogram; same of earthenware, porous or varnished, 25 per cent. on valuation of 9c per kilogram.

BOLIVIA.

No restrictions whatever as to marking, and while packages of the same kind may be numbered alike, care must be taken that two different kinds of packages are not included in the same number. Weight and measurements must be in the metric system.

BRAZIL.

No restrictions as to marking; each package, piece, etc., must bear its own individual number, each differing from the other. The gross net and actual weight of each package is required to be given in the metric system.

Tariff: Copper wire, plain, 400 reils per kilogram; same insulated with paper, cotton, or rubber, 900 reils per kilogram; same plated, gilt, or covered with silk, 2,400 reils per kilogram; same telephone, telegraph and elastic, 20 per cent.

Electro-galvanic or electro-magnetic rings, collars and chains, 16,000 reils per kilogram.

Magnetic needles, 300 reils each.

CHILI.

No restriction as to marking. Each package must have its own number.

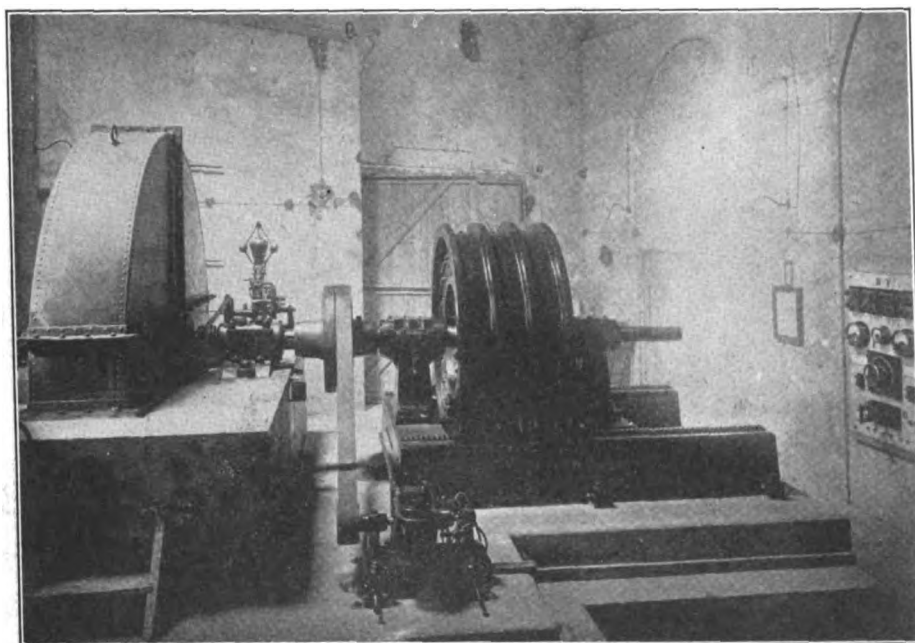


FIG. 9.—POWER HOUSE AT LANCEY, FRANCE, FOR SUPPLYING CURRENT TO 35 VILLAGES.

tials, and the tendency is to raise the voltage far above what has been considered safe in the past. What has caused this great change? Unquestionably the development of the polyphase system has been the means of bringing these high pressures within the reach of the engineer, allowing him a cheap transmission line, even though long distances must be traversed and the income expected only moderate. The polyphase motor, and the highly efficient static transformers also have aided in this result, and the very satisfactory rotary converter has also brought the system to a point of completion by being able to deliver at will direct currents to any point in the territory desired.

A New Underground Telephone Cable.

A new underground telephone cable is about to be tried in Germany. The *modus operandi* consists in drawing the cable through a wide tube containing air, and covered with a thin metal guard. It is proposed to lay the first line between Düsseldorf and Elberfeld, a distance of 22 miles.

slate or marble base, with or without cover, 25 per cent. on value of \$1.15 per kilogram.

Insulators, glass, 25 per cent. on value of .056c per kilogram, gross weight; same earthenware, falence or porcelain, of more than 3 centimeters in diameter, with or without hooks, 25 per cent. on value of 10c per kilogram, gross weight; the same up to 3 centimeters in diameter, 25 per cent. on value of 24c per kilogram, gross weight.

Wire or cables of copper, up to 5 millimeters in diameter, covered with cotton, gutta-percha, or other materials, excluding wire covered with lead or silk and flexible cords of all kinds, 25 per cent. on value of 67.2c per kilogram; the same of more than five millimeters in diameter, 25 per cent. on valuation of 54.6c per kilogram; the same up to five millimeters in diameter, covered with lead, 25 per cent. on valuation of 48c per kilogram; the same of more than 5 millimeters, 25 per cent. on valuation of 48c per kilogram; the same underground, with interior envelope of lead, and iron or steel armor, 25 per cent. on valuation of 38.4c per kilogram; the same of iron or steel, covered with cotton, gutta-percha, or other materials, 25 per cent. on valuation of 28.8c per kilogram; the same

Measurements and weights must be in the metric system.

Tariff: Telephone and telegraph apparatus, free.

Electric call-bells, 25 per cent.

Cross-arms for telegraph poles of iron or steel, free; same wooden, 25 per cent. on valuation of 32c per kilogram.

Insulators, free; lamps for electric lighting, 25 per cent. on a value of \$6 per kilogram, gross weight.

Electric meters, free.

Electric batteries free.

Telephones, free.

COLOMBIA.

The marking is restricted to one uniform mark for each consignee, two marks calling for two bills of lading. Packages of the same kind may be numbered alike, but two different kinds of packages may not go under the same number. Weights and measurements must be in the metric system.

Tariff: Telegraph wire for public use, free; same for private use, .024 centavo per kilogram.

Lighting apparatus, .01 centavo per kilogram.

Motors of all kinds, .024 centavo per kilogram.

ECUADOR.

Restriction to one uniform mark for each consignee, two marks requiring two bills of lading. Packages of same class may be numbered together, but different kinds of packages may not be mixed. Only gross weight required for each package; all weights and measures must be in the metric system.

GUIANA—BRITISH.

All machinery and wiring for electric lighting, telegraph instruments and other materials imported by telegraphic companies, and necessary for the construction and use in offices of their works and stations in the Colony, may be imported free of duty.

GUIANA—DUTCH.

Material for the construction and working of telegraph and telephone lines, also apparatus and machines for same, provided such articles be exclusively destined to the purposes named, may be imported free of duty; but the matter is left to the estimation of the Controller of Taxes, from whose decision an appeal may be made to the Minister of Finance.

GUIANA—FRENCH.

Duties are similar to those imposed on like materials imported under the French tariff into the ports of France. Apparatus for telegraph or telephone lines imported on account of the State or Colony are free of duty.

PARAGUAY.

Wire for telegraphs, free of duty, also scientific instruments. No restriction whatever as to marking; packages may be numbered alike when similar in nature. Metric system of weights and measures always used.

PERU.

Each package or piece must bear an individual number, the gross and net weight of each being required in the metric system.

Apparatus, electric or telephonic, and electric batteries, 40 per cent. on an appraised value.

Carbons for electric apparatus, 40 per cent. on an appraised value of 40 centavos per kilogram, gross weight.

Copper wire for electric motors 40 per cent. on valuation of 10 centavos per kilogram.

URUGUAY.

Numbering must be for each individual package. Metric system is employed.

Wire, bronze or copper, 31 per cent. on valuation of 48 pesos per kilogram.

Telephones and telegraphs 31 per cent. on an appraised valuation.

VENEZUELA.

No restriction as to marking. Numbering must be similar for each class of packages. Gross weight must always be stated, and the metric system always employed. Machines and apparatus for electric telegraphing when imported with the consent of the Government are only subject to a duty of .00386 of a cent per kilogram.

AN UP-TO-DATE TELEPHONE SWITCHBOARD.

The following explanation of a switchboard, said to be mechanically and electrically as near to perfection as any ever built for exchange use, will be interesting to anyone who is interested in switchboards. This new board was manufactured by L. M. Ericsson & Co., Stockholm, Sweden, for the Pittsburg Telephone Company of Pittsburg, Kansas, and it is by courtesy of the Ericsson Telephone Company of No. 296 Broadway, New York City, that we show cut of same, and also a diagram of connections.

The illustration shows one section of the board having a capacity of three hundred instruments or subscribers, and arranged with positions for three operators. By adding other sections of the same size the capacity may be increased to 600, 900, 1,200, or any multiple of 300, up to an ultimate capacity of 3,000 instruments. Boards of even larger capacity are

provided with the desired line. If it is busy there is a click heard in the operator's telephone; but if it is disengaged there is no sound, and in that case the plug is placed in the jack and the second subscriber is called by pushing the lever of the table-key toward the board to the ringing position. The table-key returns automatically to its ordinary position and the two subscribers are connected with each other.

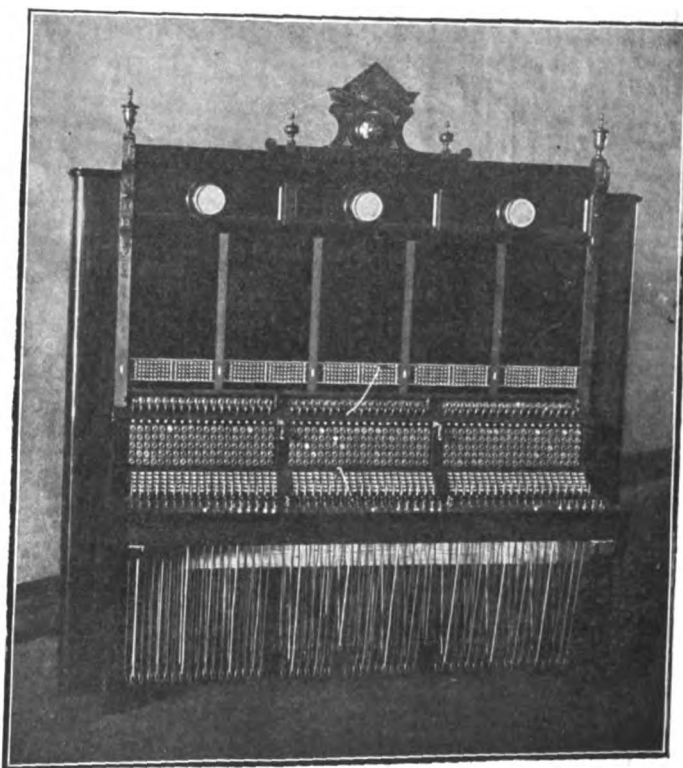
When the conversation is finished ring-off signal is given and the clearing-out drops fall and the plugs are removed by the operator.

Each operator has a counter which automatically counts the calls issuing from the exchange.

Six keys marked in pairs are fitted in front of each section. They are used for speaking and ringing to each of the two connected subscribers, separately.

If the operator desires to listen in or to speak to both the subscribers the table-key is pushed into its speaking position; but if connection with only one of them is desired the keys are used. The call is generally given by the table-key, but it can also be given by means of the other keys.

Both the subscribers' and the clearing-out drops are provided with night contact so that the night bell is rung when they are dropped.



THE PITTSBURG (KAN.) TELEPHONE COMPANY'S SWITCHBOARD.

made by the same company, but they vary somewhat from this one, which is a metallic board and full multiple, simple, rapid and positive in operation, readily accessible in every part for connections, changes, or repairs, and in every respect a most durable board. A full multiple board is so arranged that the operator can connect directly any instrument in her section with any other instrument either in her own or any other section, thus giving her command over the whole switchboard. A great saving of time is thus effected over other systems, and to the subscriber this is of the utmost importance.

We will endeavor to explain briefly the details and operation of the board.

For convenience it is divided into five panels and the plugs are placed on two different planes. It is provided with series jacks and the subscribers' drops are restored by the operator. There are eighteen pairs of cords and plugs for each operator, and the clearing-out drops are automatically restored. The lines coming from the cross-connecting board pass through jacks in the first multiple, then continue to the next corresponding multiple. From the multiple jacks the wires go to the soldering tags on the intermediate field on the back of the board. This makes it possible to distribute the labor between the operators, which is done by removing busy subscribers from one operator and placing them with another who has more time. From these tags the wires are connected with the home jacks which are placed on a sloping plane just above the table-leaf, and from there they go to the subscribers' drops.

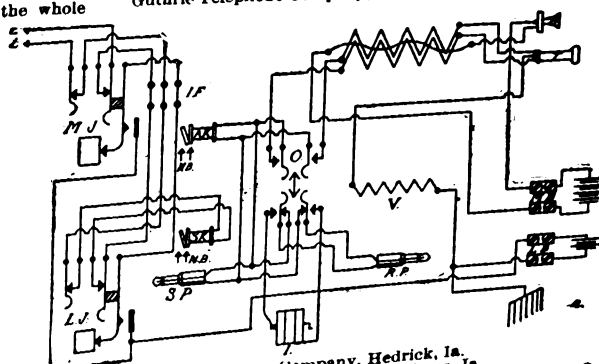
When the subscriber calls the exchange, the drop falls, and the operator places the answering plug, which is placed on the table-leaf, in the home jack, and at the same time pulls the lever of the table-key toward the edge of the table to the ringing position. After ascertaining the desired number the operator takes the ringing plug, which is on the sloping plane between the subscribers' jacks and the clearing-out drops, and touches the jack in the multiple which corre-

sponds with the desired line. If it is busy there is a click heard in the operator's telephone; but if it is disengaged there is no sound, and in that case the plug is placed in the jack and the second subscriber is called by pushing the lever of the table-key toward the board to the ringing position. The table-key returns automatically to its ordinary position and the two subscribers are connected with each other.

We might add that to be fully understood and appreciated the board should be carefully inspected and the operation, workmanship and finish could then be seen, all deserving attention and the highest praise.

Scales of switchboards have also been made by the same company to the following:

Guthrie Telephone Company, Guthrie, O. T.



Hedrick Telephone Company, Hedrick, Ia.
Crow Telephone Company, Frank Pierce, Ia.
Putnam County Telephone Company, Columbus Grove, O.
Montclair and Bloomfield Telephone Company, Montclair, N. J.

The Company states to us that they have several switchboards on the way for other customers. Some new features in instruments the company will have ready later and we can then call attention to them. While, if you are interested or in the market be sure to write them.

EXPLANATION OF DIAGRAM CUT.
L. Line; I F. Intermediate Field; O. Table-Key; M. J. Multiple Jack; S. P. Speaking Plug; N. B. Night Bell; L. J. Home Jack; R. P. Ringing Plug; V. Busy-test Coil; S. K. Subscriber's Drop; I. Generator; L. B. Test Battery; A. K. Clearing Out Drop; M. Microphone; M. B. Microphone Battery T. Telephone.

Trade News of Interest.

The American Electrical Works, Providence, R. I., whose advertisement appears elsewhere in this issue, turn out bare and insulated electric light and power wire, besides railway feeder and trolley wire. This well-known concern also manufactures high grade cables for aerial and underground use.

The American Electric Telephone Company, 36 West Jackson Boulevard, Chicago, Ill., manufactures high grade telephone apparatus of every description. This concern, among other things, has recently brought out a new cable terminal with improved stray current protector and carbon arrester, which has met with great success. An attractive catalogue will be sent anywhere upon request.

The Okonite Company, Ltd., 253 Broadway, New York, manufactures Okonite wires, Okonite tape, Manson tape and Candee waterproof wire which, for electrical purposes, cannot be excelled. This concern, which has a world-wide reputation, has taken innumerable medals for its products at all the principal world fairs.

The Norton Electrical Instrument Company of Manchester, Conn., reports a very successful business for the past year. This well-known concern manufactures reliable and accurate measuring instruments, such as voltmeters, ammeters, etc. Persons desiring apparatus in this line would do well to send for a catalogue.

The Babcock & Wilcox Company, 29 Cortlandt street, New York, reports that there has been an unusually brisk demand for its boilers during the year that has just closed. This well-known concern has offices in Havana, Cuba, at 116½ Calle de la Havana, where any information relating to its product may be obtained.

Central station engineers who are having trouble with lubricants would do well to drop a line to the Joseph Dixon Crucible Company, Jersey City, N. J., asking for a pamphlet and a sample of this concern's well-known pure Flake Graphite, which will be sent them free of charge.

The American Lamp and Brass Company, Trenton, N. J., manufactures a new type of lamp known as the "Three-in-One Lamp." The advantage of this lamp is that it may be used in connection with either oil, gas, or electricity. A catalogue may be obtained free of cost on application to the company.

The Farr Telephone & Construction Supply Company, 357 Dearborn street, Chicago, Ill., carries telephones, switchboards and supplies of all kinds. This concern handles Bridging Telephones, Series Telephones, Exchange Telephones, Desk Telephones, Transmitters, Receivers, Brackets, Glass Insulators, Iron Wire, Copper Wire, Annunciator Wire, Batteries, Hooks and everything in the supply line.

Elsewhere in this issue will be found a detailed description of a telephone switchboard manufactured by the Ericsson Telephone Company, 296 Broadway, New York. This concern has turned out telephone apparatus and switchboards, not only for this country, but for the principal European countries as well. A pamphlet descriptive of this well-known company's apparatus may be obtained free of charge at the above address.

F. N. Manross, Forestville, Conn., is said to be one of the largest manufacturers of hair springs in the United States. He makes a full and complete line of hair springs for electric indicating and recording instruments and non-magnetic hair springs of phosphor-bronze and other non-magnetic metals. Mr. Manross also manufactures, to order, hair springs of any description. The excellence of the Manross springs is said to be gaining for the maker an enviable reputation throughout the world as well as a rapidly increasing business, to what an extent may be inferred when it is stated that Mr. Manross is at present engaged in enlarging his factory.

The Wallace Barnes Company of Bristol, Conn., whose advertisement will be found elsewhere in this issue, has just gotten out an attractive catalogue descriptive of the many types of small springs manufactured by this well-known concern. This company has constantly on hand motor springs of every description, clock springs, spiral springs, extension springs and a complete assortment of the best thin-rolled steel. The plant is equipped with the most modern machinery and the facilities for prompt delivery are unexcelled. A catalogue will be mailed anywhere free of charge on request.

La "American Electrical Works," de Providence, R. I., cuyo anuncio aparece en otra parte de este número, ha puesto en el mercado alambre descubierto y aislado con destino a instalaciones eléctricas de alumbrado y de fuerza motriz, así como también alambre de alimentación para ferrocarriles y tranvías eléctricos. Esta bien conocida casa fabrica así mismo cables de superior calidad para instalaciones eléctricas aéreas y subterráneas,

La "American Electric Telephone Company," 36 West Jackson Boulevard, Chicago, Ill., fabrica toda clase de aparatos telefónicos de primera calidad. Esta casa ha puesto recientemente en el mercado, entre otras cosas, una nueva estación terminal para cables eléctricos, que está provista de un protector contra corrientes perdidas y un interceptor de carbón, que ha tenido gran aceptación. Se enviará un detallado catálogo a donde quiera que se pida.

La "Okonite Company, Ltd.," 253 Broadway, New York, fabrica alambres Okonite, cinta aisladora para los empates, marcas Okonite y Manson, y alambre que no se enmohece, marca Candee, que son inmejorables para instalaciones eléctricas. Esta compañía, que tiene fama en todo el mundo, ha recibido gran número de medallas en las principales exposiciones universales como premio a la excelencia de sus productos.

La "Norton Electrical Instrument Co.," de Manchester, Conn., ha hecho muy buenos negocios durante el año último. Esta reputada casa fabrica instrumentos de medición extremadamente exactos,



como voltímetros, amperímetros, etc. Las personas que necesiten aparatos de esta clase, harán bien si piden un catálogo a la mencionada compañía.

La "Babcock & Wilcox Company," 29 Cortlandt St., New York, ha tenido durante el año que acaba de pasar, una extraordinaria demanda de las calderas de vapor que fabrica. Esta renombrada casa tiene establecidas oficinas en la Habana, Cuba, en la calle de la Habana, núm. 116½, donde deben dirigirse las personas que en la isla deseen informes referentes a dichos productos.

Los maquinistas que en las estaciones centrales tienen dificultades con los lubricadores, allanarían pronto los inconvenientes dirigiéndose a la "Joseph Dixon Crucible Company," Jersey City, N. J., pidiéndole que les envíe el folleto sobre "Flake Graphite" (grafito especialmente preparado) y una muestra de éste, que se remiten gratis a quien los pida.

La "American Lamp and Brass Company," Trenton, N. J., fabrica una nueva clase de lámparas conocidas con el nombre de "Three-in-one Lamp" (Lámpara de tres usos). La ventaja de esta lámpara es que puede usarse bien con aceite, con gas ó con electricidad. La Compañía envía catálogo de las mismas a quien lo solicite.

La "Farr Telephone & Construction Supply Company," 357 Dearborn St., Chicago, Ill., tiene gran existencia de teléfonos, tableros de conmutadores y enseres eléctricos de todas clases. Esta Compañía vende Teléfonos Múltiples, Teléfonos para Serie, Teléfonos para escritorio, Centros telefónicos, Transmisores, Receptores, Soportes, Aisladores de Vidrio, Alambre de hierro, Alambre de cobre, Alambre anunciador, Baterías, Ganchos, en fin, todo lo concerniente al ramo de telefonía eléctrica.

En otra parte de este número aparece una detallada descripción de un tablero de conmutadores para teléfonos, fabricado por la "Ericsson Telephone Company," 296 Broadway, New York. Esta Compañía ha vendido gran número de aparatos telefónicos y tableros de conmutadores, tanto para los Estados Unidos como para los principales países europeos. Las personas que deseen un catálogo descriptivo de los aparatos fabricados por la mencionada Compañía, pueden solicitarlo de la misma, y lo recibirán gratis y franco de porte.

Trade News of Interest.

For some time a need has been felt for a good, compact and intelligent work on wiring. Mr. H. C. Cushing, Jr., has met this long-felt want by the issue of a little work entitled "Standard Wiring for Electric Light and Power." As stated in the preface the author has made it his aim to set forth as clearly as possible the essential rules and requirements for safe and economical exterior and interior electric light and power wiring, and how well he has succeeded may be inferred by the immense demand that has already arisen for this work, which retails at the extremely reasonable price of \$1.00. It may be obtained by addressing H. C. Cushing, Jr., 39 Cortlandt street, New York, or by application to this office.

In second-hand electrical and steam machinery Mayo & Rohrer Co., 220 Broadway, New York, have built up a reputation which is second to none. Their method of doing business is such that purchasers of second-hand machinery can rely on their representations. They handle only machinery of high grade and all apparatus is in first-class condition, being thoroughly overhauled before shipment. Being practical electrical and mechanical engineers their guarantee and representations can be relied upon. If you are in the market or have any apparatus for sale we would advise your corresponding with the above company.

The Haines & Noyes Company of Chicago, Ill., have recently put on the market an entirely new design of telephones and switchboards. Their instruments are all of the "Bell" type, as the electrical engineers of this company are all old Bell Telephone Company men, and their experience and ideas gained while there have been used to the greatest possible effect.

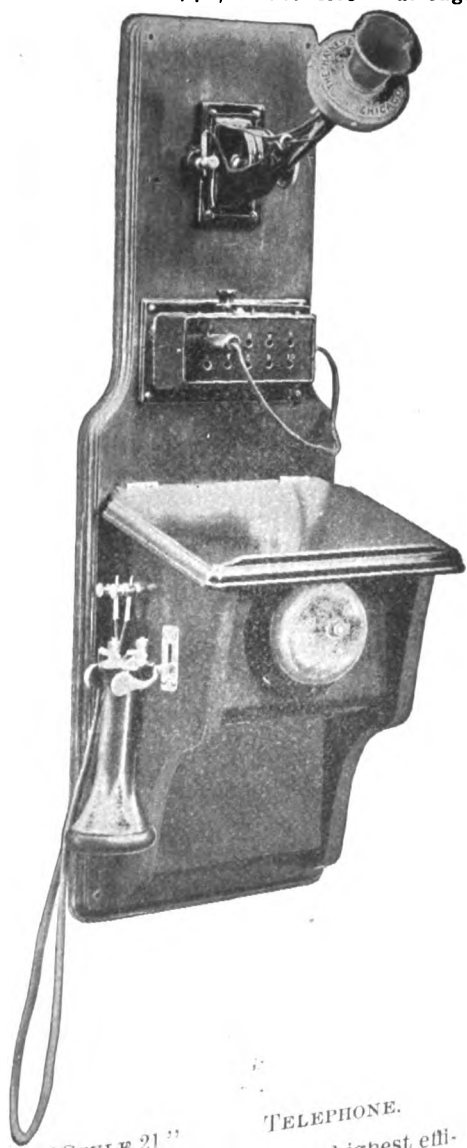
These instruments embody the most modern principles, the highest grade of material, and the most skillful workmanship possible, the result of which is to insure the production of the best apparatus ever put on the market.

These telephones excel because—the transmitters are the only absolutely non-packing transmitters in existence (patent applied for). Even water may be poured in them or suction applied without in any way impairing their working qualities. Heat does not affect them, and they are the only transmitters that can be transported long distances and retain their perfect speaking qualities.

This company manufactures all their own silk-wound induction coils used on their telephones, and they guarantee that their coils are the most powerful on the market.

The receivers are of the bi-polar "Bell" type, permanent adjustment, and of the highest efficiency—water shrunk, hard rubber shell, platinum points on all contacts.

The Haines & Noyes Company announce that they have acquired the rights to the automatic self-restoring express switchboard invented by Mr. Holyoke, of the firm of Holyoke & Holyoke, Chicago, and the important improvements made by the former's engineers, make the



"STYLE 21" TELEPHONE.

La "Wallace Barnes Company," de Bristol, Conn., que anuncia en este número, acaba de publicar un bonito catalogo descriptivo de las numerosas clases de muelles delgados que fabrica. Esta bien reputada Compañía tiene constantemente buen surtido de muelles para motores de mano de todas formas, muelles reales para relojes, muelles en espiral, muelles de extensión y un completo surtido de acero delgado laminado. La fábrica de esta casa está provista con la más moderna maquinaria y cuenta con las mayores facilidades para el rápido cumplimiento á las órdenes que reciba. Su catalogo se envía a quien lo solicite.

El señor F. N. Manroos, de Forestville, Conn., está considerado como el fabricante de muelles de pelo que mayor producción ofrece al mercado en los Estados Unidos. Su ramo comprende un surtido completo de muelles capilares para instrumentos eléctricos indicadores y registradores, así como también muelles capilares antimagnéticos de bronce fósforo y otros metales antimagnéticos. El señor Manroos fabrica también cualquier clase de muelles de pelo que se le pida. Los excelentes resultados que estos muelles están dando, han conquistado a su fabricante una reputación universal, así como un rápido crecimiento a sus negocios. Esto último lo comprueba el hecho de estar el Sr. Manroos agrandando sus talleres.

Hacia tiempo que se notaba la necesidad de un buen sistema para la instalación de alambres eléctricos, y esta necesidad ha sido llenada por el Sr. H. C. Cushing, hijo, con la publicación de un libro titulado: "Standard Wiring for Electric Light and Power." Según se dice en el prefacio del mismo, el autor se ha propuesto exponer lo más claramente posible, las reglas y condiciones esenciales para la instalación de alambres con destino al alumbrado eléctrico y fuerza motriz eléctrica, de un modo que ofrezca seguridad y economía, ya sean las instalaciones interiores ó exteriores. Este libro ha tenido gran aceptación, pues la demanda por ejemplares que su autor recibe, es enorme, siendo su precio relativamente muy barato, \$1. Los pedidos deberán dirigirse a Mr. H. C. Cushing, Jr., 39 Cortlandt St., New York, y también pueden hacerse á la administración de este periódico.

Los Sres. Mayo & Rohrer Co., 220 Broadway, New York, se han creado una buena reputación como comerciantes en maquinaria de segunda mano para vapor y electricidad. Su modo de hacer negocios es tan correcto que sus clientes muéstranse altamente complacidos de las transacciones hechas con ellos. Es una casa en la que se puede confiar absolutamente, pues sólo vende maquinaria y aparatos de primera clase, que están en perfecta condición, pues se someten a una escrupulosa prueba antes de entregarlos al comprador. Por ser dichos señores ingenieros electricistas y mecánicos, ofrecen bastante garantía para justificar la confianza de que gozan en el mercado. Todas las personas que necesiten comprar ó deseen vender máquinas y aparatos, encontrarán beneficioso dirigirse a dichos señores.

La "Haines & Noyes Co." de Chicago, Ill., E. U. A., ha puesto recientemente en el mercado modelos completamente nuevos de teléfonos y tableros de conmutadores. Estos aparatos son del tipo "Bell," pues los ingenieros electricistas de esta Compañía han estado empleados en la "Bell Telephone Co." y sus ideas y experiencia han sido aprovechadas ventajosamente. Los citados aparatos han sido aprovechados ventajosamente, están contruidos con material de primera calidad y por muy expertos y hábiles operarios, resultando de esto que son los mejores que hoy existen en el mercado. Estos teléfonos, por los cuales se ha pedido patente, son superiores á cualesquiera otros, porque sus transmisores mantienen constantemente la eficiencia de sus variables resistencias, pues aunque se les inyecte agua ó se les aplique succión, sus buenas cualidades para funcionar no se alteran. Tampoco les afecta el calor, y son los únicos transmisores que pueden transportarse á largas distancias sin que sufran el más insignificante deterioro. Esta Compañía fabrica todas las bobinas que usa en sus teléfonos y las garantiza como las más potentes que hay en el mercado. Los receptores son de la clase bipolar de "Bell" con ajustes permanentes y de la mayor eficiencia, estando provistos de una cubierta de caucho vulcanizado y sometidos á contracción en agua. En todos los contactos tienen piezas de platino. La "Haines & Noyes Co." anuncia haber adquirido los derechos al tablero de conmutadores automático que opera con gran rapidez, inventado por el Sr. Holyoke, de la casa Holyoke & Holyoke de Chicago, y las importantes

Trade News of Interest.

Haines & Noyes new board the simplest, most rapid, and most perfect board in existence (patents applied for).

This company also manufacture the best inter-communicating system for factories, office buildings, hospitals, Government buildings, etc., in the market. The cut of the wall instrument is shown here, while the desk instrument is style 5, shown in their advertisement on page X, used in combination with their new plug box. These systems are the greatest time, labor and money-saving devices of the age. This company makes new and unique telephones for hotels, apartment buildings, ranches, private residences, etc., that are the standard everywhere. Their Mexican, Central and South American trade promises to be very large.

Owing to a constantly increasing demand for its products the Sprague Electric Company, 527 West 34th street, New York, has been obliged to greatly increase the floor space in the New York office which is now located on three floors of the factory. The New York factory is devoted exclusively to the manufacture of the various lines of interior conduit and appliances which have brought the art of electric wiring to an absolute simplicity. The company operates a still larger plant in Bloomfield, N. J., where are manufactured all the light and power apparatus, such as generators, motors, fans, elevators, hoists, etc. A new branch office will soon be opened.

The Safford Arc Lamp, manufactured by the Safford Arc Lamp Company, 301 Washington street, Buffalo, N. Y., has a number of advantageous features which make it a favorite among engineers. Besides being unique in design it is mechanically perfect in construction, and yet is placed on the market at a price that defies competition. For information and prices address the company as above.

Persons desiring up-to-date telephone apparatus would do well to address The Century Telephone Construction Company, 268 Erie street, Cleveland, O., whose advertisement appears elsewhere in this issue. This well-known concern handles telephones of high efficiency and solid construction and a transmitter known as the "Can't Pack," which cannot be rivaled. Communications addressed to the company as above will receive immediate attention.

The American Toll Telephone Company, 51 Sheriff street, Cleveland, O., has recently placed on the market a new type of toll telephone for local and long-distance service which is entirely automatic and devoid of electrical connections. In this system there are no batteries to become short-circuited, no contact points to become oxidized, and yet this type of instrument can be used in connection with any telephone system. Any further information desired may be obtained at the above address.

Elsewhere in this issue will be found a page advertisement descriptive of the unique little electric motors manufactured by Jas. H. Mason, 150 Nassau street, New York. The "Oddo" motor, which sells for \$1, may be utilized to advantage for running fans and other light pieces of machinery. This miniature electric prime mover may be operated with one battery, which makes the cost for current almost nil. For detailed information address Jas. H. Mason, as above.

It may interest electrical manufacturers in this country and dealers in electrical supplies in South America to know that the London & River Plate Bank, Limited, represented by Mr. George O. Gordon, 70 Beaver street, New York City, has branch offices in Para, Pernambuco, Rio Janeiro, Santos, Sao Paulo, Montevideo, Paysandu, Buenos Aires, Rosario, Bahia, Blanca and Mendoza, where letters of credit and cable transfers will be issued, and where bills may be negotiated, advanced upon and sent for collection:

Wireless Fog Signaling at Sea.

Lights and lighthouses are of little use to protect ships from collision and shipwreck in case of dense fogs. Great expectations have been formed of the use of electric wave telegraphy for this purpose, and a trial recently made at Southend with a system devised by Col. Hozier and Mr. Neville Maskelyne seems to justify these expectations, says the London "Electrical Review." A transmitting station

was established on shore near the danger point, and signals were sent out by an automatic apparatus, consisting of a revolving wheel, whose periphery is cut into teeth of varying size. This wheel takes the place of the operator at the Morse key, and transmits the name of the place in a series of dots and dashes in the Morse code. The wheel is driven by an electro-motor or other convenient means, and it can be arranged to signal every minute or two, or continuously.

Any vessel fitted with receiving apparatus coming within the range of the transmitter will be warned by the ringing of a bell, and will receive a Morse signal of the name of the transmitting station. In the trials at Southend the vessel was fitted with a vertical conductor, 50 to 60 feet in height, and the warning signal was received at a distance of seven to eight miles. No satisfactory method of indicating the direction of the source of radiation appears to have yet been devised.

mejoras en el mismo introducidas por los ingenieros de la "Haires & Noyes Co." lo ha convertido en el más simple, el más rápido y el más perfecto que existe. Se ha pedido patente por este tablero. Esta Compañía fabrica también el mejor sistema para comunicación interior en las fábricas, edificios públicos, hospitales, oficinas del gobierno, etc. El grabado que acompaña estas líneas representa el teléfono de pared, y en el anuncio de dicha casa que aparece en la página X se verá el teléfono de escritorio, que es estilo 5, y que se usa en combinación con el tablero de conexiones. Estos sistemas son los que mayor ahorro de tiempo, de trabajo y de dinero facilitan actualmente. Esta Compañía hace unos teléfonos nuevos y exclusivos para hoteles, casas de pisos, ranchos, para familias, etc., que han recibido la preferencia dondequiera que se conocen. Los negocios de esta casa con México y las Américas Central y del Sur, prometen ser muy extensos este año.

La "Sprague Electric Company," 527 West 34th St., New York, se ha visto obligada a ampliar el espacio ocupado por sus oficinas en esta ciudad, las cuales se hallan establecidas en tres pisos del edificio en que está la fábrica. Los talleres de Nueva York están dedicados exclusivamente a la fabricación de las varias clases de conductos para instalaciones de alambres en el interior de las paredes, y enseres para esta clase de trabajo, el cual se simplifica extremadamente con dichos conductos. La Compañía tiene una fábrica mayor en Bloomfield, N. J., donde se hacen aparatos para alumbrado eléctrico y para fuerza motriz como son, generadores, motores, abanicos eléctricos, ascensores eléctricos, grúas eléctricas, etc. Pronto abrirá una nueva sucursal.

La lámpara de arco marca Safford, fabricada por la "Safford Arc Lamp Co.," 301 Washington St., Buffalo, N. Y., ofrece numerosas ventajas que son grandemente apreciadas entre los maquinistas. Además de ser, de dibujo exclusivo, su construcción mecánica es perfecta, y no obstante su superioridad, se le ha puesto un precio que no admite competencia. La mencionada Compañía dará otros informes y precios a solicitud de los interesados.

En este número aparece una página en que se anuncia y describen los pequeños motores eléctricos especiales fabricados por Jas. H. Mason, 150 Nassau St., New York. El motor "Oddo" que se vende por \$1, puede usarse convenientemente para mover abanicos eléctricos y otros aparatos ligeros. Este motor primordial, en miniatura, funciona con una batería, lo cual hace que el costo de la corriente sea insignificante. Para más detalles dirigirse al mencionado fabricante.

La "American Toll Telephone Co.," 51 Sheriff St., Cleveland, Ohio ha puesto a la venta un nuevo tipo de teléfono que funciona de igual manera que esas máquinas automáticas en las que se echa una moneda por una ranura a propósito, y proporcionan música, vistas panorámicas, etc. Este aparato se adapta para corta y larga distancia y es completamente automático, evitando las conexiones eléctricas. En este sistema no hay baterías cuyos polos vengan en contacto, ni puntos de contacto que se oxiden; no obstante, es un aparato que puede usarse en cualquier sistema telefónico. Los detalles sobre el mismo pueden obtenerse dirigiéndose a la citada Compañía.

Las personas que deseen adquirir aparatos telefónicos de los más perfeccionados, harán bien en dirigirse a "The Century Telephone Construction Company," 268 Erie Street, Cleveland, Ohio, cuyo anuncio se verá en la sección correspondiente de este número. Esta acreditada casa vende teléfonos de clase superior y de sólida construcción, y un transmisor conocido por "Can't Pack", que no tiene rival; así como también tableros de conmutadores y enseres eléctricos de todas clases. Enviará su catálogo gustosamente a quien lo pida.

THE TELEPHONE WORLD

Fine 'Phone Facilities in Chicago.

To one who has known the Chicago Telephone Company from its modest beginning in 1876, and has since had occasion to watch its growth, both in extent and efficiency, it is indeed a marvel. Then its subscribers numbered but a few hundred, now it has more than 85,000 subscribers in that and surrounding cities. Then its methods were comparatively simple and crude; now the most costly innovations have been made, every possible improvement and convenience has been added, and it begins the twentieth century with one of the largest and best equipped telephone plants in the world.

The Chicago Company has to day in use about 70,000 miles of wire, very much the largest part of which in the business portion of the city is in cables carried in underground conduits. Formerly a single wire was used, grounded at each end. Now two wires are always used, making a complete circuit for each subscriber. To handle the business so rapidly increasing the latest and most improved and expensive apparatus must be used. During the last two or three years the company has been installing in its various offices what is known as the relay multiple switchboard, which radically changes and at the same time greatly simplifies the method of making a connection, the operator being enabled by a series of small incandescent lights to tell when the 'phone is in use and when it is no longer desired. The use of all this new apparatus and the enormous growth of business has called for corresponding increase in operating space. To meet this demand the company has been compelled to build an addition to its main plant, more than doubling its size and capacity. Here the new operating room, where the calls are answered and connections made, is undoubtedly the finest and best equipped, as well as the largest in the world.

It is said in Wyandotte, Mich., now that the Detroit and Michigan telephone exchanges will be consolidated under Manager John McInnes, a new company known as the United States Telephone Company will solicit subscribers and install an independent telephone exchange. It is proposed that it shall be identified with the Martin telephone scheme in Detroit. J. W. Martin who has secured a telephone franchise in Detroit, has lately announced that business 'phones will be \$38 instead of \$40, as authorized. He says arrangements have been made to float \$600,000 of bonds to build a plant, if he gets 8,500 subscribers.

A new telephone line will be run northeast of Washington, Ia., the coming spring for several miles in the country. An enthusiastic meeting was held by the farmers a short time ago, and twenty-three pledged themselves to pay for 'phones. The line will be put in by the Washington County Telephone Company and farmers will be able to talk to neighboring cities without having messages transferred. A similar line has been southwest of the city for some time.

The first formal meeting of the Melrose, Fla., Telephone Company, was recently held. The officers elected were: Dr. J. B. Curtis, president, and Rev. A. H. Waters, secretary and treasurer. The president presented a report showing that a sufficient fund had been subscribed to construct the proposed line from Melrose to Waldo via Orange Heights in that State. It was, therefore, resolved that the work be commenced at once, and continued until completed. The distribution of the poles has already begun.

The Bloomfield, Ia., Mutual Telephone Exchange has been sold to Hon. Amos Steckel, of Bloomfield. The transfer was made in the interest of the Southeastern Iowa Mutual Telephone Association. To the city of Ottumwa it provides the connecting link to all of the Mutual telephone lines in Southeastern Iowa and Northeastern Missouri. For the reason that a vast amount of capital has been interested, it also means that within the next twelve months Davis County and several other counties in Northeastern Missouri will be simply covered with a network of telephone wires, as the many extensions planned will now be built.

The Iowa Telephone Company will build a copper metallic circuit from Sioux City to Des Moines. It will be completed by June 1. The line will be constructed as far as Fort Dodge along the line of the Illinois Central Railroad, and connection will be made at Fort Dodge with the eastern copper metallic circuit. The Sioux City copper metallic circuit to Missouri Valley will be extended along the Chicago & North-western Railroad to Boone. These new lines will give Sioux City superb talking connection with the East and South-east.

The telephone system in Athens, Ga., though a good one is to be vastly improved. Work is to be begun at once on the improvements, and in a few months no city in the South can boast of a more complete service.

'Phone Charges Fixed in Mississippi.

The Railroad Commission of Mississippi, has passed an order supervising charges for telephone messages and rent of 'phones. The maximum rates in the county are fixed at 25 cents; in the State, \$1. Maximum charge for residence phones, \$2; minimum, \$1. Business 'phones, \$4 per month. The order was hotly contested by the Cumberland Company.

Thomas McCorkle, the president, and Capt. Frank Wood, the superintendent of the Delmarvia Telephone Company in Wilmington, Del., were among the invited guests at the inspection of the new switchboard and plant of the Maryland Telegraph & Telephone Company in Baltimore. After an inspection of the plant they do not hesitate to say it is one of the most complete telephone exchanges in operation. It is a central energy, multiple system and up to date in all its appurtenances. In the selection of the Kellogg switchboard and instruments they think Baltimore may congratulate itself in having a service which will be unexcelled. The rates are reasonable and the service superior. In a short space of time the new company has accomplished what it took the old company years to achieve.

A meeting of the Columbia Long Distance Telephone Company was held recently. The stockholders are the same as those of the Syracuse, N. Y., Telephone Company. The following officers were elected for the ensuing year: President, J. J. Jermyn; vice-president, E. I. White; secretary, George H. Bond; treasurer, A. R. Peck; general manager, R. G. Jermyn. It was reported that ninety-five cities and towns had been connected and that by September 1 next subscribers could be able to communicate with New York City. The improvements which are to be made in the Snow building will increase the capacity of the plant about 50 per cent.

Certificates announcing the election of directors for the Rochester, N. Y., Telephone Company were recently filed in the County Clerk's office as follows: Frederick Cook, George W. Archer, H. Wheeler Davis, George R. Fuller, J. F. Warner, H. C. Brewster, T. W. Finucane, Albrecht Vogt, Gustave Erbe, Jacob Gerling, Edward W. Peck, Eugene H. Satterlee, W. B. Spader, E. M. Higgins and V. Moreau Smith.

A syndicate that is buying up the stock of the Standard Telephone Company will extend the system to Colmar, Bristol and Quakertown, Pa., besides making connections with the Interstate and Keystone Companies so as to cover Montgomery County. There have been dissensions in the board of directors of the Standard Company, and the new move is part of a reorganization scheme.

The New York & New Jersey Telephone Company commenced last week to lay a new underground cable on Flatbush avenue, Brooklyn. By this means the company will remove its wires from the poles where they are in danger of contact with the electric light and fire alarm boxes, and also hope to give a better service.

The negotiations which have been quietly pending for some time at Corydon, Ind., between Louisville and Cleveland and Quakertown, Pa., besides making connections with the Interstate and Keystone Companies so as to cover Montgomery County. There have been dissensions in the board of directors of the Standard Company, and the new move is part of a reorganization scheme.

The subject of another telephone company for Salt Lake City and the other important cities of Utah is again being agitated. The local promoter of the enterprise is Attorney Elmer B. Jones. He states that the new company will be called the Utah Home Telephone Company and that most of the capital for the undertaking will come from Chicago.

Boise City, Idaho, has a telephone service that is superior in every way. Two companies are operating there. The Rocky Mountain Bell Telephone Company also has a fine plant, and the Independent Telephone Company is unexcelled anywhere. The use of the long-distance telephone is constantly increasing.

A deal has been consummated by which the Cumberland Telephone Company, of Nashville, Tenn., through its agent, Mr. Siegel Bronner, will absorb the Carlisle, Ky., Telephone Company. The Carlisle Company, it is understood, besides receiving a good stiff price for its plant, has also dictated the charges to be made by the new owners.

The Missouri & Kansas Telephone Company has established a district, to be known as the Oklahoma district, and appointed J. W. Wilson, of Oklahoma, Okla., as district manager; he will have control of all of the plants of the company in the Indian Territory and Oklahoma. The company announces that it is about to begin the construction of several hundred miles of new toll lines in the two territories.

The telephone line between West Point and Oakland, Neb., was opened for business a short time ago. Numbers of farmers on the route have availed themselves of the privilege of telephonic connection with both towns. Rates between the two places have been reduced 60 per cent. and the same reduction made to all points on the Chicago, St. Paul, Minneapolis & Omaha systems.

Drafts have been sent out by the State Auditor of Minnesota on the telephone companies of the State for the 1900 gross earnings tax, which amounts to \$25,450.73, and includes forty-five companies. The Northwestern which operates in the twin cities paid \$18,669.08. The Mississippi Valley Company paid \$512.30.

The Maryland & Delaware Telephone Company, which was recently chartered in Dover, Del., and is composed of a company of Baltimore capitalists, will at once begin the construction of its line through that section.

The Keystone Telephone Company, which is backed by a number of Philadelphia capitalists, has filed a certificate with the Secretary of State, increasing its capital stock from \$2,000,000 to \$10,000,000.

The telephone line from Romney to Capon Bridge, W. Va., has been sold by the Cordon Telephone Company to Dr. E. M. Oats and his brother, of Capon Bridge. The new purchasers will rebuild and improve the line.

The project of the new building for the Central Union Telephone Company in Youngstown, O., is shortly to assume definite form. It will be a model up-to-date office building, one that will meet the needs of the business of the exchange.

It is stated that the Erie Telephone system made a net gain of 2,278 subscribers in December, and of 35,041 for the year. The total number connected December 31 was 141,599 and the number awaiting connection 2,924.

Stock is being subscribed for in the interest of a new telephone company connecting Jackson and North Jackson with Susquehanna, Montrose, Pa., and Binghamton, N. Y. via Thomson, Pa.

McKeesport, Pa., will have two telephone lines to Pittsburg after February 1, according to the announcement made by an official of the Federal Telephone Company.

Blue Rapids, Kan., will put in a telephone exchange, operated by Dr. E. Armstrong of Greenleaf, who already operates two other exchanges, one at Greenleaf and the other at Stockton in that State.

A new switchboard, with the most improved equipment at a cost of \$100,000, has lately been installed by the Bell Telephone Company of Buffalo, N. Y.

The people of Hillsboro are trying to get a telephone line to Monticello, Ga.

Decaturville and Clifton, Tenn., are now connected by telephone.

The Cumberland Telephone Company has purchased lines in Sullivan County, Tenn.

TELEPHONE INCORPORATIONS.

The Colonial Telephone Company, Newburg, N. Y. Capital stock, \$125,000. Directors: Harry A. Bartlett, V. Schoonmaker and W. G. Taggart, all of Newburg.

The Cattaraugus Telephone Company, Cattaraugus, N. Y. Capital stock, \$1,000. Directors: S. F. Burger, Frank Crawford and H. B. Easton, all of Cattaraugus.

The Overland Telephone Company, Lehigh, Pa.—to erect telephones. Capital stock, \$15,000.

The Citizens' Telephone Company, Frederickburg, Md. Capital stock, \$5,000. Incorporated by H. M. Whitney, E. D. Anthony, E. L. Graham and others.

The Moosehead Telephone Company, Greenville, Me.—to maintain telephone lines around Moosehead Lake. Capital stock, \$10,000. Officers: President, Charles D. Snow, of Greenville; treasurer, Charles A. Judkins, of Kinto.

GENERAL ELECTRICAL NEWS.

Lighting.

Atlantic, Ia.—The electric light plant here is to be substantially improved.

Blairtown, N. J.—The Blairtown Electric Light Company has purchased the water rights at the outlet of Swartwood Lake, and in future dry seasons this will be used to run the plant.

Brocton, N. Y.—This place is to have an electric lighting plant. If the village does not care to install it, residents will do so, giving the municipality the privilege of purchasing any time it sees fit after giving a year's notice.

Chestertown, Md.—The Chestertown Electric Light Company has been formed, with King Wright of Philadelphia as manager.

Chippewa Falls, Wis.—The plant of the Chippewa Falls Lighting Company is being enlarged to double the present capacity to supply power to the Chippewa Valley Electric Railway Company's road.

Columbus, O.—The board of education is discussing the question of erecting its own electric light plant in the new school building soon to be built.

Creston, Ia.—A movement has been started to organize a local electric light company.

Ellicott City, Md.—The Ellicott City Power & Electric Company's plant has been purchased by G. L. Mowen of Baltimore. The plant is to be improved.

Ellsworth, Wis.—The Ellsworth Electric Light Company has sold its plant to Willay & Buck, of Elroy, Wis.

Farmington, Mich.—The citizens will soon hold an election to vote on the question of bonding for an electric lighting plant.

Ft. Smith, Ark.—Geo. Tilles, of 1 Tilles Corner, Ft. Smith, wants to purchase electric light machinery.

Holgate, O.—The citizens of this place are agitating the question of erecting a new electric light plant.

Kendallville, Ind.—The city council has appointed a special committee to inquire into the feasibility of the city operating an incandescent electric light plant.

Magnolia, Ark.—An electric light plant is being talked about for this place.

New York City.—Sealed bids on estimates will be received by the committee on buildings of the board of education of this city at the hall of the board, southwest corner of Park avenue and 59th street, on January 21, for installing an electric lighting plant, fixtures and electric bell system for new public school 131, east side of Fort Hamilton avenue between 43d and 44th streets, Brooklyn.

Paducah, Ky.—The Paducah Electric Light Company has raised its rates 25 per cent. and aroused dissatisfaction, which is manifested in a subscription to secure another light plant.

Pierce, Neb.—The citizens are discussing the advisability of voting bonds for an electric light plant.

Plainfield, N. J.—Councilmen Valliant, Rogers and Lee have been appointed a committee to investigate the advisability and estimated cost of establishing a municipal electric light plant.

Rockwood, Tenn.—(On January 25 the citizens will be called upon to vote on the proposition of issuing \$25,000 in city bonds, the proceeds to be used for putting in a waterworks system and electric light plant.

Salida, Col.—The Edison Electric Light Company is perfecting plans for greatly increasing its plant.

Seattle, Wash.—The street lighting of this city will be done entirely by electricity this year.

Shreve, O.—The citizens of this place are organizing an electric light company to be capitalized at \$5,000. The greater part of the stock has been subscribed.

Steubenville, O.—The Steubenville Electric Company is replacing all the old style arc lights with the latest patent light.

Weiser, Idaho.—A new electric light plant will soon be erected here.

Woodstown, N. J.—Electric lights are again being talked of for this place, to be operated in connection with the cold storage plant to be erected here.

Waterbury, Conn.—The board of public works has passed a vote recommending to the board of aldermen

that this city be empowered to issue \$100,000 in bonds for installing an electric lighting plant.

Zacoalco, Mex.—A new electric light plant is being installed in this town.

Street Railways.

Auburn, Cal.—The Auburn Electric Railroad Company has been incorporated with \$50,000 to construct and operate electric street railways here. The directors are A. S. Moore, B. F. Hartley, J. H. Wills and P. C. Moore.

Bucyrus, O.—The Buckeye Traction Company of this city was lately incorporated for the purpose of building an electric line from here to Norwalk via Annapolis, New Washington and Chicago Junction.

Everett Wash.—The Everett Railway & Electric Company has decided to make extensive improvements on its system.

Cameron, Mo.—A new company is to be organized at this place to build an electric road from this city to Kansas City. The promoters of the enterprise contemplate building the road via Lathrop, Holt, Kearney and Liberty.

Clinton, Ind.—A movement is on foot to build an electric road between Paris, Ill., and this place. Congressman Andrew J. Hunter of Paris is behind the project.

Delhi, N. Y.—The citizens here are talking of building an electric road to Bloomville. The silk mill and its engines would make a good power plant. All that is lacking is the money to build the road and equip it.

Ft. Wayne, Ind.—The Ft. Wayne & Southwestern Traction Company of Ft. Wayne and Allen County was recently incorporated for \$400,000 by G. Townsend, W. S. Reed, F. G. Morehouse and C. C. Miller.

Havre de Grace, Md.—The Belair & Havre de Grace Electric Railway Company has accepted the ordinance of the city council of Havre de Grace authorizing it to lay tracks and operate an electric railway upon certain highways of this city.

Indianapolis, Ind.—Arrangements have been completed for the construction of an electric railway by the Indianapolis, Morristown & Rushville Traction Company.

Macon, Ga.—W. B. Sparks and others have organized the North & South Macon Street Railway Company to build an electric line in the city and suburbs.

Marysville, O.—This place is soon to have an electric road through Union County connecting with Richwood, Magnetic Springs and Delaware. T. N. Kerr of Columbus is the promoter.

Santa Ana, Cal.—A franchise has been granted for the construction of an electric road from here to Los Angeles, through Whittier.

Santa Fe, N. M.—M. W. McGrath is the promoter of the Santa Fe Electric Street Railway soon to be constructed.

San Bernardino, Cal.—S. Hartley of Colton has purchased the franchise granted by the city trustees last August to Judge J. L. Campbell for an electric street railroad.

Wausau, Wis.—The business men of this place and Merrill are contemplating the building of an electric road between these cities.

Manufacturing.

Brooklyn, N. Y.—The World's Life Protecting Car Fender Company of this city has recently been organized, and it proposes to manufacture and sell fenders for cars propelled by electricity, compressed air or other motive power on a capital of \$20,000. The directors for the first year are Montgomery Queen, Henry D. House and George Haring, all of Brooklyn.

Dayton, O.—The Dayton Electrical Manufacturing Company has increased its capital stock from \$20,000 to \$50,000. H. G. Catuw is president, and C. C. Hoover secretary of the company.

McKeesport, Pa.—Preparations for the erection of a large addition to the National Tube Works in this city are being made. The new department will be de-

voted exclusively to the manufacture of steel and iron trolley poles for street railway use.

Peoria, Ill.—The Thayer Electric Company has been formed here for the purpose of manufacturing electrical machinery with a capital stock of \$25,000. R. Lester Thayer, Louis R. Van Nuys and C. B. Murray are the interested parties.

St. Louis, Mo.—John S. McKinley, Frank R. Harris and Frank L. Horton are the stockholders of the Imperial Electric Plating & Manufacturing Company recently organized here with \$5,000 capitalization.

Waterbury, Conn.—The Waterbury Electric Company of 48 Jefferson street, manufactures a specialty of an electric heat regulator for dwellings and offices, which is used either with steam, hot air or hot water furnaces and regulates the fire automatically, preventing overheating of furnaces and maintaining a uniform temperature at all times.

Company Matters.

Bellows Falls, Vt.—The Bellows Falls Electric Light Company was succeeded lately by the Fall Mountain Electric Light & Power Company. The new company has a capital stock of \$100,000. There is a probability that later there will be important additions and improvements to the plant.

Delta, Pa.—The Delta Electric Power Company is having a number of inquiries for supplying electric power to concerns now using steam or about to commence business.

Ft. Scott, Kan.—The Fort Scott Electric Light & Power Company, the Citizens' Street Railway Company and the Fort Scott Steam Heating Plant were recently consolidated under a new corporation to be known as the Fort Scott Consolidated Supply Company, capitalized at \$250,000. Grant Hornaday is president of the concern.

New Haven, Conn.—The Connecticut Electrical Company of this city recently made a voluntary assignment in the Probate Court for the benefit of its creditors and named John T. Manson as trustee.

Power and Transmission.

Salt Lake City, Utah.—The Utah Construction Company is now working on the dam planned by C. K. Bannister to utilize the waters of Weber River to generate electric power at a power house to be located about one-fourth of a mile below the Union Pacific bridge.

Yolo, Cal.—The Bay Counties Power Company, the \$5,000,000 electrical plant established in Yolo County, is nearly ready for business. Its double-pole lines will run through Yolo, Solano, Contra Costa and Alameda Counties to Oakland. Sub-stations will be established at various points along the line and all the cities and towns near the line will be supplied with both electric lights and power.

Weymouth, N. J.—George Pfau, of Riverside, who is generating electricity by water power here has obtained permission from the Landis township committee to erect poles for the running of wires to Vineland, where he intends to furnish electric power for manufacturing purposes.

Mines.

Marysville, Mont.—A new series of electrical power drills was purchased a short time ago by the Big Ox Mining Company for operation in its mine near this place. This machinery is rapidly being installed, and will shortly be ready for operation.

Automobiles.

New York City.—The Progressive Cycle & Automobile Supply Company of this city was formed lately to deal in bicycles and automobiles on a capital of \$6,000. George Herrnstadt, W. S. Hofstatter and Elias Pitzele, have an interest in the firm.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Authoriz'd	Issued.					Authoriz'd	Issued.				
Albany, N. Y.—Jan 14						Hartford Conn.—Jan 14					
United Traction.....	100	\$5,000,000	\$5,000,000	1 1/2 % Q.	110 1/2	Hartford Street Ry. Co.....	100	\$4,000,000	\$200,000	8 % S., Oct.	150
(Consolidation of the Albany and Troy City Railway.)						Hartford & West Hartford RR.....	100	1,000,000	247,000		
Allentown Pa.—Jan 14						Holyoke Mass.—Jan 14					
Allentown & Lehigh Val. Trac Co.....	100	4,000,000	1,500,000		15	Holyoke Street Ry. Co.....	100	400,000	400,000	8 % A., June	207 1/2
Bridgeport, Conn.—Jan 14:						Hoboken N. J.—Jan 14					
Bridgeport Traction Co.....	100	2,000,000	2,000,000	1 % Aug.	100	North Hudson Co. (N. J.) Ry. Co.....	25	1,250,000	1,000,000	8 %	150
Baltimore Md.—Jan 14						Indianapolis, Ind.—Jan 14					
United Railways & Elec. Co.....com.	50	24,000,000	18,000,000		18 1/2	Indianapolis Street Ry.....	100	5,000,000	5,000,000		27
Boston, Mass.—Jan 14						Lancaster, Pa.—Jan 14					
New England Street Ry.....	25	5,000,000	1,081,925	1 % Q., Jan. 15,	15	Pennsylvania Traction Co.....	100	10,000,000	9,900,000		
North Shore Traction Co.....com.	100	4,000,000	4,000,000		15	Lancaster & Col. Electric Ry.....	100	87,500			
North Shore Traction Co.....pfd.	100	2,000,000	2,000,000	6 % S. A. & O.	85	West End Street Railway.....	100				
West End Street Ry. Co.....com.	50	10,000,000	6,400,000	8 1/2 % S., Oct., '99	98	Louisville, Ky.—Jan 14					
West End Street Ry. Co.....8 % pfd.	50	10,000,000	6,400,000	4 % S., Jan.	112	Louisville Ry.....com.	100	4,000,000	8,500,000	1 1/2 % S., April.	92
Boston Elevated R. R.....	100	10,000,000		2 1/2 % Aug. 99	156	Louisville Ry.....pfd.	100	2,500,000	2,500,000	2 1/2 % S., Oct. 1.	112
Brooklyn N. Y.—Jan 14:						Minneapolis, Minn.—Jan 14					
Brooklyn City Ry.....	100	2,000,000	1,928,400		230	Twin City Rapid Transit.....com.	100	17,000,000	15,010,000		68 1/2
Brooklyn Rap. Transit Co., tr. certif..	100	48,000,000	48,000,000		84 1/2	Twin City Rapid Transit.....7 % pfd.	100	8,000,000	1,712,200	1 1/2 % S., Oct.	186
Brooklyn Heights Railroad.....	100	200,000	200,000		107	Montreal, Canada.—Jan 14					
Brooklyn City RR.....guar.	100	12,000,000	12,000,000	8 1/2 % Q., Jan.,	267	Montreal Street Ry. Co.....	50	4,000,000	4,000,000	8 % S., M. & N.	271
Brooklyn, Queens Co. & Sub. RR.....	100	2,000,000	2,000,000		289	Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1 1/2 % S., J. & J.	107 1/2
Jones Island & Brooklyn RR.....	100	2,000,000	1,884,200	2 1/2 % Nov., '99	325	Memphis Tenn.—Jan 14:					
Kings County Elevated.....	100	4,750,000	4,750,000		832	Memphis Street Railway Co.....	100	500,000	500,000		2 1/2
Kings County Traction Co.....	100	4,500,000	4,500,000	1 % July	75	New Haven, Conn.—Jan 14:					
Nassau Electric Railroad.....pfd.	50	6,000,000	6,000,000		80	Fair Haven & Westville RR.....	25	2,000,000	2,000,000	8 % S., Sept.	39
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000			New Haven Street Railway Co.....	100	1,250,000	1,000,000	2 1/2 % A., July	41
Brooklyn, B. & W. E. Railroad.....	100	1,000,000	1,000,000			New Haven & Centerville.....	100	700,000			46
Buffalo N. Y.—Jan 14						Winchester Avenue RR.....	25	1,000,000	600,000		
Buffalo & Niagara Falls Elec. Ry.....	100	1,250,000	1,250,000	1 % Q. Dec., '99.	74	New Orleans, La.—Jan 14					
Buffalo Railway Co.....	100	6,000,000	5,870,500		99	Canal & Claiborne RR. Co.....	40	240,000	240,000	4 % S., July.	148 1/2
Columbus O.—Jan 14						New Orleans & Carrollton RR.....	100	1,200,000	1,200,000	1 1/2 % Q., Oct.	148 1/2
Columbus Street Railroad.....	100	8,000,000	8,000,000	1 % Q., Feb.	38	New Orleans Traction Co new com.	100				24
Columbus Street Railroad, pfd.....	100	1,500,000	1,500,000		92	New Orleans Traction Co new pfd.	100				96
Charleston, S. C.—Jan 14						Crescent City RR.....guar.	100	2,000,000	2,000,000	8 % S., Jan.,	20
Charleston City Ry. Co.....	50	100,000	100,000	8 % S.		New Or. City & Lake RR.....guar.	100	2,000,000	2,000,000	4 % S., Jan.,	52
Enterprise City RR. Co.....	25	1,000,000	250,000			Orleans Railroad.....	50	500,000	185,000	1 1/2 % S., June.	56 1/2
Chicago, Ill.—Jan 14						St. Charles Street Railway.....	50	1,000,000	1,000,000	1 1/2 % Oct.	
Chicago City Ry. Co.....	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99.	25 1/2	New York—Jan 14:					
Chicago & South Side R. T. RR.....	100	10,828,800	10,828,800		10	Central Crostown RR.....	100	600,000	600,000	2 1/2 % Q.	255
Lake Street Elevated RR.....	100	10,000,000	10,000,000	Feb 28 1900.	27	Christopher & 10th Sts. RR.....guar.	100	650,000	650,000	2 % Q., Oct.	115
Metropolitan West Side Elev. Ry.....	100	15,000,000	7,000,000		81	Dry Dock, E. Bldg. & Battery RR.....	100	1,200,000	1,200,000	1 1/2 % Q., Nov.	120
Met. West Side El., pfd.....	100	15,000,000	9,000,000		209	Dry Dock, E. Bldg. & Battery RR.....	100	45,000,000	45,000,000	2 1/2 % Q., Feb. 1900	167 1/2
North Chicago Street RR.....	100	10,000,000	6,600,000	8 % Q., Jan.	197	Metropolitan Street Ry. Co.....	100	900,000	900,000	2 1/2 % A., July.	85
North Chicago City RR.....	100	500,000	249,900		107	Bleecker St. & Fulton St. Ry. Co.....	100	2,100,000	2,100,000	2 1/2 % Q.	282
South Chicago City Railway.....	100	2,000,000	1,608,200		95 1/2	Broadway & Seventh Ave. RR.....guar.	100	1,800,000	1,800,000	2 1/2 % Q.	192
West Chicago St. RR. Co.....	100	20,000,000	18,189,000	1 1/2 % Q., Feb.	18	Can. Park, N. & E. Rivers RR. Co.....	100	1,800,000	1,800,000	2 1/2 % Q.	390
Union Traction Ry.....com.	100	1,250,000	624,900	8 1/2 %	49 1/2	Eleventh Avenue RR.....	100	1,000,000	1,000,000	4 % Q.	392
Union Traction Co.....pref.	100	2,000,000	2,000,000	5 % S.	50	Twelfth Avenue RR.....	100	800,000	748,000	4 % Q.	198
Cincinnati, Ohio.—Jan 14:						Thirtieth St. & Grand St. Ferry RR.....guar.	100	750,000	800,000		205
Cincinnati Inc. Plane Ry.....com.	50	1,000,000	575,000		75	Thirtieth St. & Grand St. Ferry RR.....guar.	100	2,000,000	2,000,000	4 % Q.	400
Cincinnati Inc. Plane Ry.....pfd.	50	150,000	150,000	2 % Feb.	124 1/2	Thirtieth St. & Grand St. Ferry RR.....guar.	100	600,000	600,000	4 % Q.	198
Cincinnati, Newport & Cov. St. Ry.....	100	3,000,000	8,500,000	1 1/2 % Q., Jan.	126 1/2	Thirtieth St. & Grand St. Ferry RR.....guar.	100	2,500,000	1,862,000	2 % Q., Jan.	120
Cincinnati Street Ry. Co.....	50	18,000,000	14,000,000	1 1/2 % Q., Jan.	126 1/2	Thirtieth St. & Grand St. Ferry RR.....guar.	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.	65
Eden Park Inc. Ry.....	50	2,500,000	2,200,000		50	Thirtieth St. & Grand St. Ferry RR.....guar.	100	2,500,000	2,500,000		190
Cleveland, Ohio.—Jan 14						Thirtieth St. & Grand St. Ferry RR.....guar.	100	2,000,000	2,000,000		
Akron, Bed. & Clev. Elec. Ry.....	100	1,000,000	1,000,000	3/4 % Jan.	102	Third Avenue RR.....	100	12,000,000	10,000,000		69
Cleveland City Ry.....	100	8,000,000	7,600,000	3-5 % Jan.	83	Third Avenue RR.....	100	2,500,000	2,500,000		24 1/2
Cleveland Electric Ry.....	100	12,000,000	12,000,000	3/4 % Q., Oct., '99.	83	Third Avenue RR.....	100	2,000,000	2,000,000		28
Detroit, Mich.—Jan 14						Union (Huckaberry) Ry.....	100	2,000,000	2,000,000		27 1/2
Detroit Citizens' Street Ry.....	100	2,000,000	1,250,000		175	Newark N. J.—Jan 14:					
Fl. Wayne & Belle Isle Ry.....	100	250,000	250,000		90	Consolidated Traction Co. of N. J.....	100	15,000,000	15,000,000		27 1/2
Rapid Railway Co.....	100	1,000,000	1,000,000		110	Consolidated Traction Co. of N. J.....	100	6,000,000	6,000,000	1 1/2 % A.	27 1/2
Detroit Electric Railway.....	100	250,000	200,000		140	North Jersey Railway Co.....	100	504,000	504,000		27 1/2
Wyandotte & Detroit River Ry.....	100	250,000			145	United Elec. Co. of New Jersey.....	100				27 1/2
Dayton O.—Jan 14						Pittsburg, Pa.—Jan 14:					
City Railway Co.....com.	100	1,500,000	1,470,500	1 1/2 % Q.	170	Allegheny Traction Co.....com.	50	500,000	500,000	2 % Jan.	67 1/2
City Railway Co.....pfd.	100	600,000	600,000	1 1/2 % Q.	170	Consolidated Traction Co.....pfd.	50	15,000,000	15,000,000	8 % Nov.	72 1/2
People's Street Railway.....	100	1,100,000	1,100,000		114	Consolidated Traction Co.....	50	9,478,850	9,478,850	1 1/2 % Nov.	72 1/2

* Unlisted. † Ex div.
 a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.
 b Leased to Boston Elevated Railroad Company.
 c Owned by Brooklyn Rapid Transit Company, which guarantees 10% on capital stock.
 d Leased to Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
 e Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
 f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
 g Owned by Atlantic Ave. RR. and leased to Nassau Electric RR.
 h \$300 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; \$300 per share on outstanding capital paid as rental by lessee—North Chicago Street Railway.
 i Controls by lease Chicago Tunnel Company.
 j West Chicago Street Railway Road Company; 5% on \$1,000,000.
 k \$25 per annum paid on outstanding stock owned by West Chicago Street Railway Company.
 l \$25 per annum paid on outstanding stock owned by West Chicago Street Railway Company.
 m Controls by lease Chicago Tunnel Company.
 n Controls by lease Chicago Tunnel Company.
 o Controls by lease Chicago Tunnel Company.
 p Leased to Consolidated Traction Company for 6% on \$5,000,000 capital stock.
 q Leased to Consolidated Traction Company for 7% on capital stock.
 r Leased to Consolidated Traction Company for 7% on capital stock.

* Unlisted. † Full paid. ‡ Outstanding. † Ex div.
 a Leased to New Orleans Traction Company at 6% on stock.
 b Leased to New Orleans Traction Company at 8% on stock and interest on bonds.
 c Leased to Central Crostown Railroad at 8% on stock having become extinct.
 d Operating the former Met. Trac. system, lease assigned to Metropolitan Street Railway.
 e Leased to Houston, West Street Ry. at 8% on stock until Oct. 1, 1897; thereafter 9%.
 f Leased to Metropolitan Street Ry. at 8% on stock until Oct. 1, 1897; thereafter 9%.
 g Leased to Metropolitan Street Railway for 18% on stock.
 h Leased to Metropolitan Street Railway for 18% on stock.
 i Leased to Met. St. Ry. for 99 years from Jan. 1, 1893, at \$215,000 per annum.
 j Leased to Metropolitan Street Railway for 18% on capital stock.
 k Leased to Metropolitan Street Railway for purchase.
 l Leased to Metropolitan Street Railway by purchase.
 m Controlled by Third Avenue Railroad by Consolidated Traction Company.
 n Dividends of 1 1/2 % yearly guaranteed by Consolidated Traction Company.
 o Controls by lease Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.
 p Leased to Consolidated Traction Company for 8% per annum on par value of stock.
 q Leased to Fort Pitt Traction Company for 6% on \$5,000,000 capital stock.
 r Leased to Consolidated Traction Company for 7% on capital stock.

PASSENGER RAILWAYS.

NAME.	Capital Stock.			Rate and Date of Last Div.	Bid.	Asked.
	Par	Authorized	Issued.			
New Bedford Mass.—Jan 14	100	\$250,000	\$250,000	2% Feb.	160	165
Union Street Railway Co.						
Northampton, Mass.—Jan 14	100	800,000	225,000	4% A., June.	170	178
Northampton Street Ry.						
Omaha, Neb.—Jan 14	100	5,000,000	5,000,000	3% A. and N.	55	65
Omaha Street Ry.						
Paterson, N. J.—Jan 14	100	1,250,000	1,250,000		54	—
Paterson Ry. Co.						
Providence, R. I.—Jan 14	100	8,000,000	8,000,000	3% Oct. '98	110	111
United Traction & Electric Co.						
Philadelphia.—Jan 14						
Fairmount Park Trans. Co.	50	2,000,000	1,770,000	2% Dec. '99.	28	24
Hestonville, Man. & Fairmount	50	1,966,100	1,966,100	2% July 15, '99.	47	48
Hestonville, Man. & Fairmount	50	588,900	588,900	3% July, '99.	76	76
Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	3% Feb. 1, '99.	76	76
Union Traction Co.	50	80,000,000	29,980,450		85 1/2	86
Electric Traction Co.	50		8,297,920		945	—
Philadelphia Passenger Ry.	50	500,000	192,500	3% share Q.	450	451
Frankford & Southwark Pass. Ry.	50		1,875,000	3% share A—Apr. '99.	90	90 1/2
Lehigh Avenue Ry. Co.	25	1,000,000	1,000,000	A. & O.	800	—
Lombard & South Street Ry.	50	1,060,000	771,076	3% share A, Mar. '98	150	151
Second & Third Streets Ry.	50	10,000,000	16,000,000	3% A., April, '98.	151	152
People's Traction Co.	50	1,500,000	572,800	3% share A—1898.	151	152
Germantown Passenger Ry.	50	500,000	150,000	3% Jan., 1898.	151	152
Green & Coates Passenger Ry.	50	1,500,000	740,000		151	152
People's Passenger Ry.	25	1,500,000	277,402		151	152
Philadelphia Passenger Ry.	50	750,000	277,402		151	152
Philadelphia Traction Co.	50	80,000,000	120,000,000	3% p. sh., Oct. '98.	151	152
Catherine & Bainbridge St.	50	1,000,000	400,000	3% A—Mar. '98.	151	152
Continental Pass. Ry.—guar.	50	1,000,000	580,000	3% share—July, '98.	151	152
Empire Passenger Ry. Co.	50	600,000	600,000		151	152
Philadelphia City Pass. Ry.	50	1,000,000	475,000	3% share July '98	151	152
Philadelphia & Gray's Ry. RR.	50	1,000,000	298,650	3% share July '98	151	152
High Avenue Passenger Ry.	50	750,000	420,000	3% share July '98	151	152
Philadelphia & Darby Ry. guar.	50		200,000	3% share July '98	151	152
17th & 19th Sts. Pass. Ry.	50		250,000	3% share July '98	151	152
Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	385,000	3% share July '98	151	152
Union Passenger Ry. Co.	50	1,500,000	900,000	3% share July '98	151	152
West Philadelphia Pass. Ry.	50	750,000	750,000	3% share July '98	151	152
Rochester, N. Y.—Jan 14	100	5,000,000	5,000,000		20	23
Rochester Railway Co.						
Reading, Pa.—Jan 14	100	1,000,000	1,000,000	Semi-ann. Jan. & July	24	26
Reading Traction Co.						
City Passenger Ry.	50	850,000	850,000	Jan., '98.	188	—
East Reading Electric Ry.	50	1,000,000	1,000,000	Jan., '98.	70	—
St. Louis, Mo.—Jan 4						
Fourth Street & Arsenal Ry.	50	800,000	150,000		—	—
Jefferson Avenue Ry. Co.	50	400,000	400,000	2% Dec. 1888.	—	—
Linell Ry.	100	2,500,000	2,400,000	1% Jan. '99.	—	—
National Railway Co.	100	2,500,000	2,479,000	1% Jan. '99.	—	—
Cass Avenue & Fair Grounds	100	2,500,000	2,500,000		—	—
City of St. Louis RR.	100	2,000,000	1,500,000	4% Oct. '98.	—	—
St. Louis RR.	100	2,000,000	2,000,000	2% Jan. '99.	—	—
Missouri RR.	50	2,400,000	2,800,000	1% Jan. '99.	—	—
People's RR. Co.	50	1,000,000	300,000	5% Dec. '89.	18	19
United Electric Ry.	50	500,000	500,000		46	47
United Electric Ry.	100	1,000,000	1,000,000	3% Jan. '99.	68	65
St. Louis & Suburban Ry.	100	2,500,000	2,500,000		68	70
Union Depot RR.	100	4,000,000	4,000,000	3% A., July, '99.	—	—
San Francisco, Cal.—Dec.						
California St. Cable RR.	100	1,000,000	600,000	5% monthly.	117	119
Geary Street Park & Ocean RR.	100	1,000,000	875,000	\$2.50 share, '96.	50	—
Market Street Ry.	100	18,750,000	18,750,000	Q., 60c. per share.	61 1/2	63 1/2
Presidio & Ferries RR.	100	1,000,000	550,000		16	—
Seranton, Pa.—Jan 14						
Seranton Railway Co.	50	6,000,000	2,500,000		29	30
Seranton & Carbonate Trac. Co.	100	500,000	500,000		16 1/2	—
Seranton & Pittston Traction Co.	100	1,050,000	1,050,000		—	—
Springfield, Mass.—Jan 14						
Springfield Consolidated Ry.	100	750,000	750,000		—	—
Springfield O.—Jan 14						
Springfield Street Ry.	100	1,000,000	1,000,000		—	11
Springfield, Mass.—Jan 14						
Springfield Street Ry.	100	1,200,000	1,166,700	8% A.	207	212
Toronto, Canada.—Jan 14						
Toronto Street Ry.	100	6,000,000	6,000,000	1% B.	108 1/2	109
Montreal Street Railway Co.	100	4,000,000	4,000,000	4% B.	272 1/2	273
Washington, D. C.—Jan 14						
Belt Ry. Co.	50	500,000	500,000		—	—
Capital Traction Co.	100	12,000,000	12,000,000	5% per sh. Oct. '99.	102 1/2	102 1/2
Columbia Ry. Co.	50	400,000	400,000	6% A.	85	40
Rockington & Soldiers' Home Ry.	50	707,000	652,000		29	21
Georgetown & Tenallytown Ry.	50	200,000	200,000		—	—
Metropolitan RR. Co.	50	1,000,000	458,900	2% Q.	—	—
Worcester, Mass.—Jan 14						
Worcester Traction Co.	100	8,000,000	8,000,000		87 1/2	35
Worcester Traction Co.	100	2,000,000	2,000,000	3% B., Feb.,	104	106
Worcester & Suburban Street Ry.	100	550,000	542,500	4% B., 1899	—	85
Wilkesbarre, Pa.—Jan 14						
Wilkesbarre & Wyoming Val. Trac.	100	5,000,000	5,000,000	1% Jan.	25	29

*Unlisted. †Paid in. ‡Full paid. §Outstanding. ¶Ex-div.
 a Leased to Hestonville, Man. & Fairmount Passenger Ry. for 6% on stock per annum.
 b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
 c Practically all shares owned by Union Traction Company.
 d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
 e Leased to Electric Traction Company.
 f Controlled by Frankford & Southwark Passenger Railway.
 g Leased to People's Passenger Railway at \$5 per share.
 h Majority of stock owned by People's Traction Company.
 i Lease to Union Traction Company.
 j Lease transferred to Union Traction Company.
 k Leased to Union Traction Company at a rental of \$10,000 per annum in 1896-7-8.
 l In 1899-1900 and \$30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.
 m Dividend of 10% guaranteed by Reading Traction Company.
 n Dividend of 6% guaranteed by Reading Traction Company.
 o Leased and operated by the Seranton Railway Co., formerly Seranton Traction Co.

TELEPHONE AND TELEGRAPH COS

NAME.	Capital Stock.			Rate and Date of Last Div.	Bid.	Asked.
	Par	Authorized	Issued.			
Boston, Mass.—Jan 14						
American Tel. & Tel. Co.	100	50,000,000	28,650,000	4% Q., Jan.	162	164
Eric Telephone & Telephone Co.	100			1% Q., Feb. 20,	54	55
New England Telephone Co.	—	10,894,600	10,804,600	\$1.50 p. sh. Feb	127 1/2	128
New York.—Jan 14						
American Telegraph & Cable Co.	100	14,000,000	14,000,000	1% Q.	91	94
Central & South Am. Tel. Co.	100	6,500,000	6,500,000	1% Q.	100	105
Commercial Cable Co.	100	10,000,000	10,000,000	1% Q.	173	175
Franklin Tel. Co.	100	1,000,000	1,000,000	1% Q.	42	50
Franklin Telegraph & Telephone Co.	100	5,000,000	4,800,000	1% Q., Feb.	—	—
Gold & Stock Tel. Co. guar. 6%	100	5,000,000	—	1% Q.	116	118
International Ocean Tel. Co. guar. 6%	100	8,000,000	—	1% Q.	116	118
Mexican Telephone Co.	100	2,000,000	—	1% Q.	8	8 1/2
New York & New Jersey Tel. Co.	100	5,000,000	3,728,000	2% Q., Jan.	175	180
Pacific & Atlantic Tel. Co. guar. 4%	25	2,000,000	—	2% S.	70	75
Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1% Q.	—	—
Southern & Atlantic Tel. Co. guar. 5%	25	950,000	559,525	1% Q.	95	100
Commercial Union Telegraph Co.	25	500,000	500,000	3% S., Jan., '99.	115	—
Western Union Telegraph Co.	—	—	97,870,000	1% Q., Jan. '99.	86 1/2	86 3/4
Div. guar. by Postal Tel. Co.						
Miscellaneous.—Jan 14						
American Dist. Tel. (Phila.)	25	400,000	—	1% Q.	26	27
Bell Tel. Co. (of Canada.)	100	8,960,000	8,564,000	2% S.	188	—
Chesapeake & Potomac Tel. Co.	100	—	—	—	47	70
Chicago Telephone Co.	100	—	—	—	200	210
Central Dist. Prtg. & Tel. Co. (Pha.)	100	750,000	750,000	—	148	150
Empire & Bay States Telephone Co.	100	2,000,000	2,000,000	1% Q.	75	76
Hudson River Telephone Co.	100	2,000,000	2,000,000	1% Q.	119	120
Northwestern Telephone Co. guar.	50	2,500,000	2,500,000	2% Q.	122	125
Providence (R. I.) Tel. Co.	50	—	—	—	16	99
Southern New Eng. Tel. Co.	100	8,000,000	—	—	—	—

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

Boston, Mass.—Jan 14						
Fort Wayne Electric trust receipts.	—	—	—	—	118	125
Fr. Wayne Elec. Co. T. Sec. Series A.	25	—	—	—	18	25
General Electric Co. [old] com.	100	40,000,000	80,460,000	2% Q., Aug., 1898.	22	28
General Electric Co. [new] com.	100	18,276,000	18,276,000	1% Q., Apr., 1900	19 1/2	19 1/4
T. H. Elec. Co. T. Sec. Series C.	50	—	146,700	—	52 1/2	54
Westinghouse Elec. & Mfg. Co. com.	50	4,000,000	3,996,058	1% Q., Jan.	84	85
Westinghouse El. & Mfg. Co. pfd.	50	11,000,000	8,195,126	—	44 1/2	45
New York.—Jan 14						
Edison Elec. Ill'g Co., New York.	100	9,188,000	7,988,000	—	119	120
*Edison Elec. Ill'g Co., Brooklyn.	100	4,000,000	2,000,000	1% Q., Oct., '98.	8	12
Edison Ore Milling Co.	100	—	—	—	—	—
Electric Vehicle Co. com.	100	—	—	—	—	—
General Electric Co. [old] com.	100	40,000,000	80,460,000	2% Q., Aug., 1898.	19 1/2	19 1/4
General Electric Co. [new] com.	100	18,276,000	18,276,000	1% Q., Apr., 1900	41	—
Interior Conduit & Insulation Co.	100	1,000,000	1,000,000	—	110	125
Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	—	—
Pittsburg, Pa.—Jan 14						
Allegheny County Light Co.	100	500,000	500,000	J. & J	168	172
East End Electric Light Co.	50	800,000	800,000	Q	—	—
Philadelphia, Pa.—Jan 14						
Edison Electric Light Co.	100	2,000,000	—	—	144	144 1/2
*Electric Storage Battery Co. com.	100	8,500,000	—	—	80	84
*Electric Storage Battery Co. pfd.	100	5,000,000	—	—	81	87
Northern Elec. Light & Power Co.	10	550,000	550,000	—	18	18 1/2
Southern Elec. Light & Power Co.	10	187,500	187,500	—	80	—
Miscellaneous.—Jan 14						
Bridgeport (Conn.) Elec. Lt. Co.	25	500,000	—	—	47	48
Missouri-Edison (St. Louis) com.	25	—	—	—	20	21
Eddy Electric Mfg. Co.	25	—	—	—	9	14
Hartford (Conn.) Elec. Light Co.	100	850,000	—	—	175	176
Hartford (Conn.) Lt. & Power Co.	25	175,000	—	—	6	10
New Haven (Conn.) Elec. Lt. Co.	100	100,000	—	—	195	—
Narragansett (Prov. R. I.) Elec. Co.	50	1,200,000	—	2% Q., Oct.,	98 1/2	99
Rhode Island Elec. Protec. Co.	100	—	—	—	118 1/2	12 1/2
Royal Elec. Co. (Montreal).	—	1,000,000	—	4% Q.	206 1/2	20 1/2
Toronto (Canada) Elec. Light Co.	100	1,088,000	1,088,000	1% Q.	183 1/2	85
Thomson-Houston Welding Co.	100	—	—	3% S., Dec. 1,	—	100
Woonsocket (R. I.) Electric Co.	100	—	—	—	105	108

†On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to \$20,827,200, of which \$18,276,000 is common and \$2,551,200 preferred.
 ‡Ex div.
 §Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

Boston, Mass.—Jan 14						
American Electric Heating Co.	50	10,000,000	—	—	—	—

ELECTRICITY.
BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bid.	Asked.	NAME.	Amount.		Due	Interest periods.	Bid.	Asked.
	Authorized.	Issued.						Authorized.	Issued.				
Albany N. Y.							New Orleans La.						
Date of Quotation—Jan 14, 1900							Date of Quotation—Jan 14 1900.						
The Albany Ry. Co. Cons. mtg. 5s.	\$500,000	427,500	1980	J. & J.	117%	.....	Canal & Claiborne RR. cons mtg. 6s.	\$150,000	7150,000	1912	M. & N.	105%	.....
The Albany Ry. Co. Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*116%	.....	Oreocent City RR. 1st mtg. 6s.	.....	50,000	1899	M. & N.	.....	.....
Waterfront Turnpike & RR. 1st mtg. 6s.	850,000	850,000	1919	M. & N.	*125	.....	Oreocent City RR. Cons. mtg. g. 5s.	5,000,000	8,000,000	1948	J. & J.	108	.....
Waterfront Turnpike & RR. 2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	.....	New Orleans City RR. 1st mtg. 6s.	416,500	899,000	1908	J. & D.	108	112
Troy City Railway Co. 1st 5s	.....	.....	1942	.....	*116%	.....	N. Orleans City & Lake RR. 1st mtg. g. 5s.	5,000,000	2,599,500	1948	J. & J.	112	118
Interest guar. by Albany Ry. Co. Principal and interest guar. by Albany Ry. Co.							O. Orleans & Carrollton RR. 2d mtg. g. 6s.	850,000	860,000	1907	F. & A.	.....	.....
							Orleans Railroad Co. Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	.....	.....
							St. Charles St. RR. Co. 1st mtg. 6s.	800,000	75,000	1906	J. & D.	.....	.....
							1428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.	.....	.....	.....	.....	.....	.....
							1890,000 outstanding.	.....	.....	.....	.....	.....	.....
Baltimore Md.							New York.						
Date of Quotation—Jan 14, 1900.							Date of Quotation—Jan 14, 1900						
United Electric Ry. Co. 1st mtg. g. 4s.	38,000,000	18,000,000	1949	M. & S.	102	102%	Atlantic Ave. (Brooklyn) Imp. g. 5s.	1,500,000	1,500,000	1984	J. & J.	95	.....
..... income 4s.	14,000,000	.....	1949	J. & D.	74%	95	Atlantic Av. (Brooklyn) 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107%	110
Baltimore City Pass. Ry. 1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118%	.....	Atlantic Av. (Brooklyn) Cons. mtg. 5s.	8,000,000	1,966,000	1981	A. & O.	115	116
Baltimore Traction Co. 1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120	Brooklyn Ave. (Brooklyn) Cons. mtg. 5s.	12,500,000	7,650,000	1948	J. & D.	128	125
Baltimore Trac. Co. Exten. & Imp. g. 5s.	1,250,000	1,250,000	1901	M. & S.	104%	.....	Brooklyn Ave. & 7th Ave. 1st cons. mtg. g. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105%
Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s.	1,750,000	1,750,000	1942	J. & D.	121	121%	Brooklyn Ave. & 7th Ave. 2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Bal. Trac. Co. Coll. Trust 1st mtg. g. 5s.	750,000	.....	1900	J. & J.	101	.....	Brooklyn Surface 1st mtg. 5s.	1,125,000	1,125,000	1924	.....	115	117
Baltimore Traction Co. Convertible 5s.	800,000	.....	1906	N. & M.	103%	.....	Brooklyn Surface 2d mtg. 5s.	1,000,000	1,000,000	1905	.....	105	106
Baltimore Traction Co. Cons. mtg. 6s.	96,000	117,000	1912	J. & J.	.....	.....	Brooklyn City RR. Co. 1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Central Pass. Ry. Co. 1st mtg. 6s.	601,000	580,000	1922	M. & N.	119	121	Brooklyn City & Newtown 1st mtg. 5s.	2,000,000	2,000,000	1989	J. & J.	115	116
Central Pass. Ry. Co. Cons. mtg. g. 5s.	8,000,000	8,000,000	1922	J. & D.	116	117	Brooklyn Bath & W. E. RR. 1st mtg. 5s.	1,000,000	448,000	1983	J. & J.	101	.....
City & Suburban Ry. 1st mtg. g. 5s.	1,000,000	1,000,000	1942	M. & S.	117	.....	Brooklyn Heights RR. 1st mtg. 5s.	250,000	250,000	1941	A. & O.	104	.....
Lake Roland Elev. 1st mtg. 5s.	.....	.....	.....	.....	.....	.....	Brooklyn, Q's Co. & Sub'n. 1st mtg. 5s.	8,500,000	8,500,000	1941	J. & J.	112	.....
*All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.							Brooklyn, Q's Co. & Sub'n. 1st cons. 5s.	4,800,000	2,750,000	1941	M. & N.	107	.....
							Brooklyn Rapid Transit gold 5s.	7,000,000	5,181,000	1945	.....	109%	.....
							Bleecker St. & Fulton Ferry RR. 1st mtg. 7s	700,000	700,000	1900	.....	95%	100%
							Cent Pk. N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
							Central Cross-town RR. 1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	.....
							Coney Island & Brooklyn RR. 1st mtg. 5s.	800,000	800,000	1908	J. & J.	101	108
							D. Dock, E. B'd'y & Bat'y R. gen. mtg. g. 5s.	1,000,000	980,000	1982	J. & D.	117	120
							Dry Dock, E. B'd'y & Bat'y RR. scrip 5%.	100,000	1,100,000	1914	F. & A.	102	105
							Eight Ave. RR. Co. Cert. indebt. 6%.	000,000	1,000,000	1914	F. & A.	108	.....
							42d St., Man. & St. Nich. Av. 1st mtg. 6s.	200,000	1,200,000	1910	M. & S.	116%	117
							42d St., Man. & St. N. Av. 2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	87	.....
							Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1938	M. & S.	124	125
							Metropolitan St Ry Co. g. m. cl. tr. g. 5s.	12,500,000	19,500,000	1907	F. & A.	120	.....
							Second Avenue Ry. Gen. cons. mtg. 5s.	1,600,000	1,600,000	1909	M. & N.	120	121
							Second Avenue Ry. Deb. 5s.	800,000	800,000	1909	J. & J.	108%	109
							Steinway Ry. (L. I.) 1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
							South Ferry RR. Co. 1st mtg. 5s.	850,000	850,000	1919	.....	110%	112%
							Third Avenue RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1907	J. & J.	.....	125%
							Twenty-third Street Ry. 1st mtg. 6s.	150,000	150,000	1906	J. & J.	108	108
							Twenty-third Street Ry. Deb. 5s.	2,000,000	2,000,000	1942	F. & A.	118	119
							Union (Huckleberry) Ry. 1st mtg. 5s.	500,000	500,000	1948	J. & J.	110	114
							Westchester Electric RR. 1st mtg. 5s.	.....	.....	.....	.....	.....	.....
							181,085,000 in escrow to retire gen. mtg. bonds.	.....	.....	.....	.....	.....	.....
							184,850,000 in escrow to retire maturing obligations.	.....	.....	.....	.....	.....	.....
							185,000 per m. in escrow to retire 1st and 2d mtg. bonds.	.....	.....	.....	.....	.....	.....
							In treasury, \$80,000.	.....	.....	.....	.....	.....	.....
							Guar. by Union Ry. Co.	.....	.....	.....	.....	.....	.....
Chicago Ill.							Toronto Canada.						
Date of Quotation—Jan 14, 1900.							Date of Quotation—Jan 14, 1900						
Chicago City Ry. 1st mtg. 4%.	6,000,000	4,619,500	1901	J. & J.	101%	2%	Montreal St. Ry. 1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	.....	.....
Chicago Passenger Ry. 1st mtg. 6s.	400,000	400,000	1908	F. & A.	.....	102	Toronto St. Ry. 1st mtg. g. 4%.	4,550,000	2,200,000	1921	M. & S.	.....	.....
Chicago Passenger Ry. Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	.....	.....	1885,000 per m. single track authorized.	.....	.....	.....	.....	.....	
Chicago & So. Side R. T. 1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	.....	.....	800,000 in escrow to retire 6s due in 1901.	.....	.....	.....	.....	.....	
Chicago & So. Side R. T. 4%.	1,500,000	750,000	1907	J. & J.	108%	109	Philadelphia.						
Chicago & So. Side R. T. 1st mtg. 4%.	4,040,000	4,040,000	1982	J. & J.	108%	109	Date of Quotation—Jan 14, 1900.						
Chicago West Div. Ry. 1st mtg. 4%.	7,574,000	8,781,200	1928	J. & J.	.....	96%	Continental Pass. Ry. 1st mtg. 6s.	850,000	810,000	1909	J. & J.	.....	.....
Lake Street Elevated RR. 1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	.....	Empire Pass. Ry. 1st mtg. 7s.	800,000	700,000	1900	J. & J.	.....	.....
Metrop. W. Side Elev. Ry. 1st mtg. g. 5s.	8,171,000	8,171,000	1906	J. & J.	106	.....	Greene & Coates St. Ry. 1st mtg. 6s.	100,000	100,000	1898	J. & J.	.....	.....
North Chicago St. RR. 1st mtg. 5s.	500,000	500,000	1911	J. & J.	.....	.....	Lombard & So. St. Pass. Ry. 1st mtg. 6s.	250,000	250,000	1905	J. & J.	.....	.....
North Chicago St. RR. Cert. indebt. 6s.	500,000	500,000	1900	J. & J.	.....	.....	People's Pass. Ry. 1st mtg. 6s.	500,000	458,000	1911	J. & J.	.....	.....
North Chicago City Ry. 1st mtg. 6s.	2,500,000	2,500,000	1927	M. & N.	108	.....	People's Pass. Ry. 2d mtg. 5s.	1,125,000	897,000	1912	M. & S.	.....	.....
North Chicago City Ry. consol. 4%.	4,100,000	8,969,000	1928	M. & N.	101	111	People's Pass. Ry. Cons. mtg. 5s.	5,698,210	.....	1948	.....	.....	.....
West Chicago St. RR. 1st mtg. 5s.	2,700,000	700,000	1911	J. & D.	101	102	People's Pass. Ry. 3d mtg. 5s.	200,000	200,000	1910	J. & J.	.....	.....
West Chicago St. RR. Debent. 6s.	12,500,000	6,000,000	1986	.....	108%	107	Phila. City Passenger Ry. 1st mtg. 5s.	1,800,000	1,018,000	1917	F. & A.	.....	.....
West Chicago St. RR. Cons. mtg. g. 5s.	1,500,000	1,500,000	1909	F. & A.	.....	.....	Philadelphia Trac. Co. Coll. tr. g. 4s.	100,000	100,000	1908	A. & O.	.....	.....
W. Chicago St. RR. Tunnel. 1st mtg. 5s.	.....	.....	.....	.....	.....	.....	Thirteenth & 15th St. Ry. 1st mtg. 7s.	500,000	500,000	1911	A. & O.	.....	.....
Redeemable at option on 60 da. notice.	.....	.....	.....	.....	.....	.....	Union Passenger Ry. 1st mtg. 5s.	29,735,000	29,724,876	1945	A. & O.	.....	.....
Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.	.....	.....	.....	.....	.....	.....	Union Traction Co. Coll. tr. 4s.	.....	.....	1905	.....	.....	.....
Subject to call after Oct. 1, 1899, at \$10 and interest.	.....	.....	.....	.....	.....	.....	West End Passenger Ry. 1st mtg. 7s.	.....	.....	1906	A. & O.	.....	.....
Assumed by W. Chi. RR. Co., lessee.	.....	.....	.....	.....	.....	.....	West Phila. Pass. Ry. 1st mtg. g. 6s.	250,000	246,000	1906	A. & O.	.....	.....
Int. guar. by W. Chicago St. RR. Co.	.....	.....	.....	.....	.....	.....	West Phila. Pass. Ry. 2d mtg. 6s.	750,000	750,000	1928	M. & N.	.....	.....
Cincinnati, O.							Pittsburg Pa.						
Date of Quotation—Jan 14, 1900							Date of Quotation—Jan 14, 1900.						
Cin. New. & Cov. St. Ry. 1st Cons. mtg. g. 5s	8,000,000	2,500,000	1922	J. & J.	114%	115	Birmingham, Knox & Allentown 6s.	500,000	500,000	1981	M. & S.	111%	.....
Mt. Adams & Eden Pk In. 1st mtg. 6s.	46,000	46,000	1900	A. & O.	114	104	Central Traction Co. 1st mtg. 5s.	875,000	875,000	1920	J. & J.	.....	.....
Mt. Adams & Eden Pk In. 1st mtg. 6s.	100,000	100,000	1905	A. & O.	108%	.....	Citizens' Traction Co. 1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	.....	.....
Mt. Adams & Eden Pk In. Cons. mtg. 5s	581,090	581,000	1906	M. & S.	121%	122%	Duquesne Traction Co. 1st mtg. 5s.	1,500,000	1,500,000	1980	J. & J.	.....	.....
Co. Cov. & Cin. St. Ry. 1st mtg. 6s.	250,000	250,000	1912	M. & S.	121%	122%	*Fed'l St. Pleas. Val. Jack's Run 5s.	50,000	50,000	1918	J. & J.	.....	.....
So. Cov. & Cin. St. Ry. 2d mtg. 6s.	400,000	400,000	1982	J. & J.	182%	187	Fed'l St. & Pleasant Valley Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	.....	.....
Assumed by the Cin. St. Ry. Co.	.....	.....	.....	.....	.....	.....	Millvale, Elma & Sharpsburg 5s.	750,000	750,000	1928	M. & N.	110	.....
19250,000 reserved to retire 1st mtg. bds.	.....	.....	.....	.....	.....	.....	Pittsburg, Craction & Mansfield 5s.	250,000	250,000	1924	J. & J.	.....	118
Cleveland O.							Providence R. I.						
Date of Quotation—Jan 14 1900							Date of Quotation—Jan 14 1900.						
Brooklyn Street RR. Co. 1st mtg. 6s.	600,000	600,000	1908	M. & S.	106%	107	Newport Street Ry. Coupon 5s	50,000	50,000	1910	J. & D.	.....	.....
Cin. New't & Cov. St. Ry. Cons. mtg. 5s.	8,000,000	2,500,000	1922	J. & J.	114%	108	United Trac. & Elor Co. 1st mtg. g. 5s	9,000,000	8,260,000	1988	M. & S.	116	118
Cleveland City Cable Ry. 1st mtg. 6s.	2,000,000	2,000,000	1909	J. & J.	105%	107	St. Louis						
Cleveland Electric Ry. Co. 1st mtg. g. 5s.	8,500,000	1,249,000	1918	M. & S.	.....	.....	Date of Quotation—Jan 14, 1900.						
Columbus (O.) Cent. Ry. 1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	.....	107%	Baden & St. Louis RR. 1st mtg. 5s.	250,000	250,000	1918	J. & J.	101%	100%
East Cleveland RR. 1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	.....	.....	Cass Ave. & Fair Gds Ry. 1st mtg. 5s.	1,813,000	1,813,000	1912	J. & J.	101%	100%
Fl. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	.....	1922	M. & N.	.....	.....	Citizens' Railway Co. 1st mtg. 5s.	2,000,000	1,800,000	1907	J. & J.	109	.....
Lorain (O.) Street Ry. 1st mtg. 6s.	200,000	200,000	1915	J. & J.	.....	.....	Comp. Hts. Un. De. & Mer. Ter. 1st	1,000,000	1,000,000	1901	J. & J.	17	.....
Ph. Ry. Co., Grand Rapids. 1st mtg. 5s.	600,000	600,000	1912	J. & D.	.....	.....							
181,500,000 in escrow to retire bonds of absorbed companies, marked a.	.....	.....	.....	.....	.....	.....							
Interest guar. by Cons. St. Ry. Co.	.....	.....	.....	.....	.....	.....							
Detroit, Mich.							Providence R. I.						

PASSENGER RAILWAY

NAME	Authorized	Issued	Due	Interest Period	B. & O.	Div.
St. Louis.						
Date of Quotation—Jan 14, 1900						
Jefferson Avenue Ry. 1st mtg. 6s.	400,000	400,000	1906	M. & N.	108	108
Lindell Ry. Co. 1st mtg. 6s.	1,500,000	1,500,000	1911	F. & A.	108	108
Missouri R.R. Co. 1st mtg. 6s.	1,000,000	700,000	1916	M. & S.	106	106
Mountain City R.R. Co. 1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's R.R. Co. 1st mtg. 6s.	125,000	125,000	1902	J. & D.	.....	.....
People's R.R. Co. 2d mtg. 7s.	75,000	75,000	1902	M. & N.	.....	.....
People's R.R. Co. Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric Co. 1st mtg. 6s.	75,000	75,000	1906	J. & J.	100	101
St. Louis R.R. Co. 1st mtg. 6s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
St. Louis & Sub. Ry. 1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry. Income 5s.	800,000	800,000	.....	.....	80	84
Southern Electric Ry. Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	108	108
Taylor Avenue St. Ry. 1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot R.R. Co. 1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot R.R. Co. Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122
†Controlled by St. Louis R.R. Co.						
†Controlled by Union Depot R.R. Co.						
†Controlled by Lindell R.R. Co.						
†\$200,000 in escrow to retire 1st & 2d mtg.						
†\$500,000 in escrow.						
†\$200,000 in escrow to retire 1st mtg.						
†do.						
San Francisco Cal.						
Date of Quotation—Dec 1900						
California St. Cable R.R. 1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
Ferris & Cliff House Ry. 1st mtg. 6s.	650,000	650,000	1914	M. & S.	.....	117
Geary St., Park & Ocean R.R. 1st mtg. 6s.	1,000,000	671,000	1921	A. & O.	.....	96
Market St. Cable Ry. Co. 1st mtg. g. 5s.	8,000,000	8,000,000	1918	J. & J.	126½	.....
Metropolitan Ry. Co. 1st mtg.	200,000	.....	.....	.....	.....	.....
Omnibus Cable Co. 1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	.....
Park & Cliff House Ry. 1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
Park & Ocean Ry. 1st mtg. 6s.	250,000	250,000	1914	J. & J.	115	.....
Powell St. Ry. 1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Union St. Ry. Co. 1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	.....	.....
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Jan 14, 1900						
Belt Ry. Co. 1st mtg. 6s.	600,000	450,000	1920	J. & J.	.....	.....
Columbia Ry. 1st mtg. 6s.	500,000	500,000	1914	A. & O.	182	.....
Rockington & Soldiers' Home Ry. 1st mtg. 6s.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan R.R. Co. Coll. tr. cons. g. 5s.	500,000	500,000	1901	J. & J.	.....	.....
†\$50,000 in escrow to retire 1st mtg. bds.						
Miscellaneous						
Date of Quotation—Jan 14, 1900						
Bridgeport Traction Co. 1st mtg. 6s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co. Cons. mtg. 6s.	5,000,000	8,548,000	1981	F. & A.	118	.....
City of Buffalo Ry. Co. 1st cons. mtg. 6s.	4,000,000	8,000,000	1983	M. & N.	104	108
Croftstown St. Ry. (Buffalo) 1st mtg. 6s.	8,000,000	2,366,000	1982	M. & N.	112	118
Columbus (O.) St. Ry. 1st cons. g. 5s.	8,000,000	2,261,000	1982	J. & J.	115	.....
Consolidated Traction (N. J.) 1st mtg. 6s.	15,000,000	18,965,000	1982	J. & D.	111½	111½
Croftstown St. Ry. (Col'd's, O.) 1st mtg. g. 5s.	2,000,000	572,000	1988	J. & D.	115	115½
Denver City Cable Ry. 1st mtg. g. 5s.	4,000,000	8,800,000	1920	J. & J.	20	.....
Denver Tramway Co. Cons. mtg. g. 5s.	4,000,000	922,000	1988	A. & O.	80	85
Louisville (Ky.) Ry. 1st cons. mtg. g. 5s.	6,000,000	4,981,000	1919	J. & J.	119	119½
Minneapolis St. Ry. 1st cons. mtg. g. 5s.	5,000,000	4,050,000	1919	J. & J.	110½	110½
No. Hudson Co. Ry. (N. J.) Cons. mtg. 6s.	8,000,000	2,878,000	1928	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.) 2d mtg. 6s.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.) Deb. 6s.	500,000	489,000	1902	F. & A.	.....	.....
Patterson (N. J.) Ry. Cons. mtg. g. 5s.	1,250,000	1,000,000	1981	J. & D.	.....	.....
Rocheester (N. Y.) Ry. 1st mtg. 6s.	8,000,000	2,000,000	1980	A. & O.	.....	.....
St. Paul City Ry. Cons. g. 5s.	5,500,000	4,298,000	1987	.....	106½	106
St. Paul City Ry. Deb. g. 5s.	1,000,000	1,000,000	1900	.....	108	.....
†\$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
†\$500,000 in treasury Bonds guar. by Buffalo Ry. Co.						
†\$700,000 in escrow to retire bonds of C. St. R.R. Co.						
†\$87,000 in treasury						
†\$500,000 res'ed to redeem prior bonds.						
†\$520,000 in escrow						

*With interest

ELECTRIC LIGHT AND ELECTRIC MFG. COOS

Boston, Mass.						
Date of Quotation—Jan 14, 1900						
Delaware Gas Lt. Co. 1st m. 6s. g.	800,000	800,000	.....	J. & J.	106	108
Edison Elec. Illuminating Co., Boston	2,026,000	.....	.....	Quar.	167	.....
General Electric Co., gold coup. deb. 6s.	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa.						
Date of Quotation—Jan 14, 1900						
Allegheny County Light Co. 6s.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co., Corp. 6s.	195,570	.....	.....	M. & S.	.....	.....
Miscellaneous—Jan 14, 1900						
Edison El. Ilig. Co. (N. York) 1st m. 6s.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilig. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1998	.....	124	.....
Edison Elec. Ilig. Co. (Brooklyn)	5,000,000	5,000,000	1940	.....	122½	124
Edison Electric Light (Philadelphia) ..	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Pow. Co. 1st mtg. 6s.	2,500,000	.....	1987	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 6s.	5,176,000	.....	1997	A. & O.	120	122
Milwaukee El. Ry. & Lt. Co. 1st con. g. 5s.	8,000,000	.....	.....	F. & A.	102½	.....
United El. Light & Power Co. (N. Y.) ..	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous						
Date of Quotation—Jan 14, 1900						
American Bell Telephone 4s.	.....	.....	1908	F. & A.	100½	101
Northwestern Telegraph Co. 7s.	.....	.....	.....	.....	.....	.....
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 5s.	.....	.....	.....	.....	114	115
Chesapeake & Potomac Teleph. Co. 6s.	.....	.....	1911	J. & D.	108	116

ALLIED INDUSTRIES.

Miscellaneous						
Date of Quotation—Jan 14, 1900						
American Electric Heating 7s.	500,000	510,000	.....	.....	.....	25
Armington & Sims Engine Co. 6s.	.....	.....	.....	.....	.....	107
Barnes & Smith Car Co. 6s.	.....	.....	1942	J. & J.	106	.....
Carborundum Mfg Co. 6s.	.....	.....	1904	J. & D.	.....	.....
Washington Pump Co. 6s.	75,000	.....	.....	.....	115	127
Unlisted						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16¼c.; Lake, 16½@17c.; casting, 16½@16¼c.

The Chicago Edison Company has declared the regular quarterly dividend of 2 per cent., payable February 1.

The Electric Company of America has declared a semi-annual dividend of 50c. per share, payable January 31.

The American Telephone and Telegraph Company has purchased for \$500,000 Prof. M. Pupin's invention for submarine telephoning.

The Northern Ohio Traction Company has bought the Akron & Cuyahoga Falls Rapid Transit Company. The price is over \$500,000.

The annual meeting of the American District Telegraph Company will be held January 24. Books close January 17 and reopen January 25.

It is rumored that the Widener-Elkins syndicate has practically secured control of the Cincinnati Street Railway Company; it is said that 51 per cent. of the stock has been secured.

The Gas and Electric Company of Bergen County, N. J., reports for the period June 1 to December 31, gross earnings, \$140,190; operating expenses, \$87,524; net earnings, \$52,665.

The Brooklyn City Railroad Company has declared the regular quarterly dividend of 2½ per cent., payable January 15. Books closed January 10 and reopen January 16.

Directors of the United Traction Company, of Pittsburg, Pa., have declared the regular semi-annual dividend of 2½ per cent. on the preferred stock, payable January 21.

The Appellate Division has fixed the amount of property of the Brooklyn Rapid Transit Company taxable in this State, for State purposes, at \$34,907,561, and the tax thereon at \$53,499.

The Massachusetts gas and electric light commissioners are quoted as strongly opposed to the contemplated absorption by J. P. Morgan of the Boston and Edison electric companies on the basis proposed.

The Fitchburg & Leominster Street Railway Company has petitioned the Massachusetts Railroad Commissioners for authority to issue \$300,000 20-year 4½ per cent. coupon bonds, payable semi-annually.

The Cincinnati, Hamilton & Dayton, Ohio, Railway Company has declared the regular quarterly dividend of 1½ per cent. on its preferred stock, payable February 8. Books close January 24 and reopen February 9.

According to a press report the Whitney-Widener-Elkins syndicate is endeavoring to secure control of the gas and electric light plants of Hamilton, O., presumably in the interest of the United Gas Improvement Company.

The New York "News Bureau" says it is understood that Consolidated Railway, Electric Light & Equipment Company has completed a contract with Vicker, Sons & Maxim, of London, for the handling of the company's foreign business.

The Wheeling W. Va., Traction Company has filed a deed of trust to the Western Reserve Trust Company, of Cleveland, O., for \$2,500,000 of bonds, to be issued by the newly consolidated railway. The bonds will run thirty years and bear 5 per cent. interest.

The Northwestern Elevated Railroad Company of Chicago reports for the seven months ended December 31: Gross earnings, \$525,023; operating expenses, \$180,451; net earnings, \$344,571; fixed charges, \$221,553; surplus, \$123,018. Earned on preferred stock, 2.46 per cent., which is equal to 4.2-10 per cent. per annum.

Although there is much talk of a Metropolitan-Manhattan alliance, says the Boston "News Bureau," the buying of the latter stock seems to come from Gould-Sage interests rather than from the Whitney-Ryan contingent. It is believed, furthermore, that if there is any Whitney buying in the tractions it is confined to Brooklyn Rapid Transit.

The directors of the Edison Electric Illuminating Company of Boston have declared a regular quarterly dividend of 2 per cent. and 1 per cent. extra, payable February 1. The previous quarterly dividend was 2 per cent. and 1 per cent. extra. If this distribution is continued, it will place the Edison Company's stock on a 12 per cent dividend basis.

At a meeting in Boston on January 10 the directory of the Erie Telephone Company was increased to 25 members. Nine of the directors retired, and the following eleven new directors were added: Gordon Abbott, Walter Abbott, Philip Dexter, Wm. Endicott, Jr., Reginald Foster, Elmer E. Foye, Thos. J. Hopper, Francis R. Hart, Jas. A. Parker, Edw. A. Phippen, Jos. G. Stearns.

Regarding reports that the Massachusetts Electric Companies has been looking over the Haverhill, Merrimac & Amesbury Railway and the Citizen's Street Railway Company of Amesbury, Mass., Manager Sullivan of the Massachusetts Electric Companies says: "We are not looking over any road with a view to purchase. We are not in the purchasing line. We are satisfied with what roads we have and are devoting our attention to putting our roads into a cohesive system."

A large stockholder in the Metropolitan West Side Elevated Railway Company of Chicago is reported as saying: "It has always been the policy of the company to pay to stockholders what has been earned. The road has earned 14-10 per cent., not including the earnings of January and February, applicable to the preferred stock, for the last six months of the current fiscal year, which ends February 28, 1901. The company will pay not less than 1½ per cent., no more than 20 per cent. early in February, covering the last half of the year."

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EDITORIAL NOTES.

The Northwestern Electrical Association Convention.

Elsewhere in this issue
will be found in detail
the proceedings of the
Northwestern Electrical
Association Convention,
which was held in Mil-

waukee, Wis., on January 16, 17 and 18.

As usual a number of exceedingly instruc-
tive papers were presented, which elicited in-
teresting discussions. The committee appointed
to examine into the courses in the various corre-
spondence schools made its report, and among
other things recommended that the correspond-
ence schools referred to be individually re-
quested to reorganize their courses for central
station employes to conform more nearly to the
actual requirements. This idea of reporting
on the methods of correspondence schools is an
excellent one, and was gone into quite thor-
oughly by ELECTRICITY a few years ago.

At the recent Milwaukee Convention, it was
decided to hold a summer meeting, probably
in June, at Sheboygan, Wis., which is situated
on Lake Michigan. The plan of holding such
a gathering is a good one as it affords the
members an opportunity of enjoying a pleas-
ant outing, while reaping at the same time
benefit in a professional way. That these sum-
mer meetings are most enjoyable, can be testi-
fied to by all those who were fortunate enough
to have participated in the trip through the
lakes a few years ago.

At the Convention just drawn to a close the
attendance was large, while the social fea-
tures were everything that could be desired.

* * *

The New Tariff in San Salvador.

Central America, more liberal in some of its
arrangements than preceding tariffs. A note-
worthy feature of the new tariff is that the
duties under it are assessed upon a gross
weight. All invoices must be made out in
Spanish; must include the name and residence
of the shipper and of the consignee; the marks
of the packages; the number, weight and kinds
of goods; the gross and net weight in kilograms;
the value of each article in its country of ori-
gin, together with the total value of the ship-
ment. Incomplete invoices are not accepted,

and two or more packages on the same invoice
must not be of the same number.

The duties on electrical equipment are as
follows: Electric motors, 18 cents per 100
pounds; magnets, 18 cents per 100 pounds; arti-
cles, apparatus, machinery, tools and materials
for telegraph and electric lights, 18 cents per
100 pounds, and an exemption from the surtax
of 55 cents per 100 pounds, additional for pub-
lic debt, to which all articles not specifically
exempt are subjected; carbide of calcium, ad-
mitted free; graphite or plumbago, in powder,
\$1.84 per 100 pounds; globes and illuminating
sundries of all kinds, \$4.60 per 100 pounds;
telephones, electric bells, small electric ma-
chines and parts, \$5.52 per 100 pounds; mica,
92 cents per 100 pounds; mining apparatus, free,
if imported on an order obtained from the Min-
ister of Finance. Thirty percent. additional is
charged on the total amount of duties for
charitable purposes.

In addition to the foregoing provisions for
electrical apparatus a contract was entered
into between Carlos Melendez and the Govern-
ment of Salvador, by which he enjoys the
privilege of importing free of all duty, until
1905, all kinds of electrical machinery and fit-
tings, and all wire cables. But such goods
must be covered by an invoice describing them
minutely, and it is understood that such goods
so imported are to be used in works estab-
lished by Melendez.

* * *

No Electric Street Railways in Operation in London.

It is hard for residents
of New York city to
realize the backward
condition of London in
the way of up-to-date
methods of surface
transportation. While this city enjoys many
miles of electric conduit roads, according to our
London correspondent, the people of the English
metropolis are content to journey to and from
their places of business in lumbering 'busses.
In short, no electric street railways are yet in
operation in any part of London. Referring to
this condition of affairs our correspondent
states that if it were not for the activity in
underground electric railways the electric trac-
tion engineer would find the English metropo-
lis, of all places, the most disappointing. The
lines of the London United Tramway Company
in West London, though quite completed, are
still not allowed to run on account of the trou-
ble with the magnetic observatory at Kew. A
series of experiments have been proceeding

lately under the joint direction of the Kew Observatory authorities, the Board of Trade and the Tramway Company with a view to ascertaining the exact extent of the interference. Mr. Robinson of the Tramway Company expects that an agreement will shortly be arrived at and that the cars will be allowed to run.

The London County Council has definitely decided upon an electric conduit system for certain central thoroughfares. It has been expressly designed by Professor Alexander Kennedy for the purpose, and now merely awaits approval of the Board of Trade and the local authorities through whose districts the lines will be run.

A company which is to lay electric lines in the southeastern district, round Greenwich way, proposes to employ the Schuckert surface contact system, which has been under somewhat prolonged trial at Munich, and is now being exploited in England. Rumor also has it that there is shortly to be another trial made in London with accumulator trams. Recent battery traction history does not give the proposal a very rosy aspect, unless the promoters have something exceptional in the way of a battery.

* * *

A Method of Preparing Sugar by Electrolysis.

The electric current is every day growing more important in industry, as new applications for it are found. Not so

very many years ago about the only practical use made of electricity was in lighting, while at present it drives machinery of all kinds, bores holes in armor plates, is utilized in the pressing of cloth and refines copper. In an interesting paper presented at the recent Congress of Applied Chemistry at the Paris Exposition M. Dupont pointed out another important use for the electric current and set forth at considerable length the result of his researches on the subject of the preparation of and the extraction of the many kinds of sugar by means of electrolysis.

The electrolytic apparatus which he used in his researches was, in the main, composed of a wooden vat divided into three compartments by porous partitions: the electrodes were metallic plates of various kinds, according to the results he wished to obtain.

The electric current employed was from 14 to 15 volts and with a volume varying from 25 to 30 amperes per square meter of the anode.

In the preparation of sugar from beets and from sugar-cane the juice is placed in the middle compartment of the electrolyzer and water in the two end compartments. A plate of lead or aluminum used as an anode is placed in the sugar juice and sheet-iron plates are placed in the water compartment to serve as cathodes.

The albuminoidal matter of the juice is coagulated and precipitated under the action of the current, the salts are decomposed and the soluble bases are separated.

Under this treatment the juice becomes clear, limpid and colorless, and besides the sugar there is found only traces of lime, magnesia, and, depending on the anode used, a small amount of the salts of lead or of aluminum. The sugar remains intact in the positive liquid.

In addition to the advantages which this process presents, from the industrial manufacturing standpoint of sugar, we can henceforth investigate, identify and adulterate the differ-

ent sugars with a large number of vegetable substances.

With the current mentioned above it is understood that it takes about an hour and a half to treat a solution containing about 15 per cent. of sugar.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

THE New York Electrical Society will hold its 211th meeting on the evening of January 30 at the Edison Station of the New York Gas & Electric Light, Heat & Power Company, corner of Elm and Duane streets. Dr. Louis Bell, who is chairman of the National Electric Light Association Committee on Incandescent Lamp Standards, will deliver a lecture on "Electric Illumination at the Beginning of the Twentieth Century." Through the abundant facilities afforded by the Station, Dr. Bell will illustrate his remarks by frequent demonstrations.

A PLAN for the electric illumination of the Postoffice Department at Washington, D. C., on March 4, the night of the inauguration, has been prepared by Chief Electrician Lloyd of the building, which he believes, will surpass any feature of the proposed illumination.

THE towpath of the Miami and Erie Canal is being laid with steel rails and the trolley wires have been strung for quite a distance. It is expected to have the system in operation between Cincinnati and Dayton, O., a distance of 68 miles, within the next year. The work was begun last June, and according to the contract it must be in operation in its entirety within six years. The motors are to be 200 horse power, and instead of drawing one boat will draw several. The motors will not be for speed, the average being four miles an hour.

THE Niagara Falls Power Company is now constructing a second transmission line between Niagara Falls and Buffalo, N. Y., and this new line will be completed within a month at the latest. The cables that are being strung on it are made of aluminum. There are three aluminum cables being placed in position, and these form one three-phase transmission system. In each of the aluminum cables there are 37 wires or strands, which give the aluminum cables a much greater diameter than the copper cables of the old transmission line. Both the copper and the aluminum cables are bare.

THE figures submitted to City Electrician Ellicott of Chicago by Electric Inspector Hornsby show an increase in the use of electricity as motive power. Previous to and including 1892 1,172 motors, having a capacity of 3,496 horse power, were installed. In 1899 2,196 motors, with 8,688 horse power, and during 1900 2,464 motors, with 18,715 horse power, were installed. The total number of incandescent lamps installed up to 1900 in Chicago was 1,320,857.

REPRESENTATIVES of twelve automobile clubs met recently in the office of President A. R. Shattuck, of the Automobile Club of America, at 11 Broadway, New York City, to discuss means for placing substantial signposts upon the leading highways. President Shattuck represented the Automobile Club of

America, and the other clubs with delegates in the conference were the Automobile Clubs of Baltimore, North Jersey, Philadelphia, Long Island, Westchester, Rhode Island, Bridgeport, Massachusetts, Brooklyn, Pennsylvania and New Jersey. It was decided to begin by making the route from New York to Boston, going by way of Bridgeport, New Haven, Springfield and Worcester, and from Boston to Providence, Providence to Newport. In addition it was proposed to place signs on the road from New Haven to Providence, the road from New Haven to Philadelphia, which will probably be by way of Princeton and Trenton. Other routes will be from New York to Albany and from New York to the principal points on Long Island. Later in the summer it is hoped to extend these signposts from Buffalo to Albany and thence on to Worcester so that it will be possible, with the aid of these posts, to travel quickly from Niagara Falls to Boston.

It has been suggested in Chicago that a crusade against gongs be inaugurated, and a firm operating several automobiles there has supplanted its gongs by more mellow chimes.

THE Eatonton electric cotton mill located at Eatonton, Ga., is now running on full time and turning out cloth to its full capacity. It has in operation one hundred looms, which are kept running only during the day, while the spinning is going on night and day. It produces an average of 30,000 yards of sheeting a week. From seventy-five to a hundred hands are constantly employed.

IN the midst of a Channel snowstorm, as the Belgian steamer *Clémentine* crossed from Ostend to Dover on January 7, a final official trial of the Marconi system of wireless telegraphy took place, with complete success. A dozen Belgian Government officials were on board to witness the trial before recommending the system for adoption on all the Belgian Channel packet boats. They were quite satisfied with the day's achievements. Messages were regularly exchanged between the *Clémentine* and Ostend until the boat drew alongside Dover pier. The result will be the installation of the system on the Belgian boats. It is said the British authorities have prohibited the use of the Marconi system on English boats. Mr. Marconi now contemplates establishing stations all round the English coast, to enable vessels at any distance up to sixty miles from land to communicate with the shore.

THE Branden (Man.) Electric Company is establishing a long-distance transmission system and is erecting a plant at a water power 10 miles distant from the town. The equipment consists of a 500-hp. generator and a 500-hp. synchronous motor with 500-hp. in step-down and step-up transformers. The transmission will be carried out on the three-phase system at 10,000 volts.

A DISPATCH from Los Angeles, Cal., to the St. Louis "Globe-Democrat" states that a device for the utilization of the sun's heat in creating power has just been put into operation at South Pasadena. The device comprises a funnel-shaped reflector 334 feet in diameter at the top and 15 feet at the bottom, and containing on its surface 1,788 mirrors. This reflector is set on two fixed supports in such manner that it may follow the movement of the sun,

and is kept in focus by clockwork. The adjustment of the mirrors is such that the sun's rays are concentrated on a boiler, tubular in form, 13½ feet in length, with a capacity of 100 gallons of water and eight feet additional for steam space. The concentration of heat is capable of raising the temperature to several thousand degrees, but the boiler is prevented from being superheated by the water within it, which is brought to 350 or 400 degrees. The engine is fed and the supply of water in the boiler is maintained automatically and the only attention necessary to operate the machine is to adjust the mirror to focus and set in operation in the morning. This motor is pumping from a large underground tank at the rate of 1,400 gallons a minute.

SEVERAL automobile owners in Troy, N. Y., are making arrangements to form a club. Runs have already been made to Saratoga, Schenectady and other localities, and the automobilists have secured a storage headquarters where electric vehicles can be recharged.

It has been noticed in certain parts of America and in India, says the "Trade Journal's Review," that during thunderstorms incandescent lamps that are alight suddenly brighten up very considerably, in some cases sufficiently to break the filament; and in some instances the brightening is followed by the lamps giving an inferior light to that which it gave previously to the storm. It has been suggested that this phenomenon is due to a similar action to that which takes place in the coherer, which is used in the high tension form of wireless telegraphy, viz., a closing up of the molecules, and a corresponding decrease of the electrical resistance of the filament, this having been observed in coherers, when thunderstorms have passed over the places where they were fixed. It appears more likely, however, that it is due to pressures induced by the passage of charged clouds over the lines connected to the lamps, the increased brightening taking place when the induced pressures were in accord with the service pressures.

FROM Berlin comes the report that Emperor William recently ordered Privy Councilor Rathenau, the Potsdam Director of the Allgemeine Elektrizitäts-Gesellschaft, to report upon plans for introducing electric traction on Germany's trunk lines, a matter in which the Kaiser is deeply interested. Herr Rathenau informed the Emperor that the first experiments would be made next summer on the military road from Berlin to Zessen, a distance of thirty kilometers. Machines are now being built which are expected to speed from 200 to 250 kilometers, (132 to 155 miles). The plan contemplates connecting the largest German cities electrically with a system of single cars, carrying sixty persons each, running every ten or fifteen minutes, and capable of covering two hundred and fifty kilometers. Emperor William expressed his astonishment at the figures and estimates placed before him, and promised to render all the assistance in his power to what he called a "great national undertaking."

MR. CORNU, a well-known French scientist, has recently been carrying out some extensive experiments on the effects of the earth's magnetic field on the rate of chronometers. His conclusions, which one could have predicted

from first principles, says the London "Electrical Engineer," are that the earth's field has a distinct influence on the time-keeping of chronometers. The influence, however, is not a fixed one, but depends upon the magnetic movement of the balance wheel, and of the hair-spring. The obvious conclusion is that in order that chronometers may be quite free from interference from either variations in the earth's field, or from artificial magnetic fields produced by electric light wires, etc., they should be constructed on the non-magnetic principle.

EASTERN CANADIAN capital has purchased outright the Greenwood Electric Company and the Greenwood & Phoenix Tramway Company and \$75,000 has been divided by shareholders in the two concerns. The tramway company owns a valuable charter obtained from the Provincial Government about two years since, giving the undertaking the right to build an electric tramway from Greenwood to Wellington, Phoenix, Summit and Deadwood camps, with a line down Boundary Creek, passing the Standard pyritesmelter, to Midway, on the international boundary line. Surveys have been made of that portion of the line between Greenwood and Phoenix, and the entire scheme is a feasible one. The road, when built, threatens to become a serious competitor to the Canadian Pacific Railway on ore tonnage, which has at the cost of many millions of dollars already completed the construction of spurs to the camps mentioned. The electric tramway, when built and equipped, will represent an expenditure of not less than \$1,000,000.

MANAGER HOWARD SCRIBNER, of the Fifth Avenue Stage Coach Line in this city, has completed arrangements for the transfer of the automobile stages of the New Haven Stage Line to the Fifth Avenue Line. A deal by which the New Haven automobiles come into the possession of the Fifth Avenue Line was closed January 21 in New Haven by him.

IF the present plans are carried out the spring and summer of this year will witness a remarkable change in the industrial development of Northern New York. Electricity will be the cause of the change and the Massena Power Company with practically unlimited supply will furnish it. Electricity for lighting and for furnishing power will be supplied, it is claimed, at a low cost to every city, village and hamlet in Northern New York from Watertown to Plattsburg, and perhaps even greater distances.

THE United States Weather Bureau began the first systematic attempts in 1898 to ascertain the amount of damage done by lightning in the United States. The statistics collected for 1899 have just been published in the "Monthly Weather Review." A thorough system for obtaining this information has not yet been perfected, but though the statistics are only approximate it is believed they include most of the cases where important damage was done. The number of buildings damaged or destroyed by lightning in 1899 was 5,527; in addition to these 729 buildings caught fire as a result of proximity to other structures that were fired by lightning. The approximate loss in 2,825 cases was \$3,016,000. In 3,431 cases the amount of loss was not reported, owing, undoubtedly, in a majority of instances to the

fact that it was very small. The report says that a conservative estimate of the total loss by lightning during the year would be \$6,000,000. It is noteworthy that the great majority of buildings struck by lightning were not provided with lightning-rods. This was also the case in 1898. On the other hand seventy buildings provided with rods were struck and damaged in 1899.

RAILROAD operating officials are a unit in the opinion that the electric headlight which a number of railroads are now adopting to take the place of the old-fashioned warning light is one of the most important improvements in recent years.

PROFESSORS A. H. THILSEN and C. E. Hesse from Washington are assisting Prof. R. A. Fessenden in conducting wireless telegraphy tests between the life-saving stations along the coast of Virginia and North Carolina. The party recently went to Hatteras where they will erect their first tower. Others will be erected at Cape Henry, Va., and Roanoke Island, N. C. The first object is to use the wireless telegraphy along the coast when the telegraph wires between the various life-saving stations and to the Norfolk signal office become damaged by storms or otherwise. It is the purpose of the Government to give the wireless telegraphy experiment a thorough test on the coast during the present winter. Prof. Fessenden will have entire charge of the work.

THE New York Gas & Electric Light, Heat & Power Company is making an interesting experiment in tunnel building which, if successfully accomplished, will practically revolutionize the usual system of construction. At its immense power plant at 39th street and the East River it proposes to build a tunnel under the East River, through which all the water required for condensing purposes at the plant will be obtained. This circular tunnel, 225 feet in height and 12½ feet in diameter, is now being built at the yard of Lewis Nixon, the ship-building firm, thirty-eight miles away from the power plant. When the length is completed the whole tunnel will be towed up the Bay and the immense structure will be sunk in the place required. The final details, which will be completed by divers, will consist merely of riveting the tunnel with the shore approaches.

OBITUARY.

Elisha Gray.

Prof. Elisha Gray died suddenly in Newtonville, Mass., early in the morning of January 21. Death was due to heart trouble.

Prof. Gray began life as a blacksmith in Ohio in 1850 at the age of fourteen. He later took up carpentering and became a boat builder. While earning his living he found time to take a full course at Oberlin College where he became especially interested in scientific subjects. Prof. Gray and Dr. Graham Bell invented the telephone almost simultaneously, although the latter filed his application for a patent about an hour before Prof. Gray.

Prof. Gray for many years gave his whole attention to bringing out and perfecting electrical devices, and to his untiring efforts and wonderful mind is due the typewriting telegraph, the telegraphic repeater, the telautograph, and still more recently, a system of submarine telephony. The death of this famous inventor is a serious blow to the electrical fraternity and industry.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 11.

MOTORS.

We might head this article transmission of power by electrical currents, or transformation of energy, and either one would be just as appropriate as the one selected.

By the use of a dynamo we transform the energy of the steam or water power to electrical energy and by the use of a motor we transform electrical energy to mechanical energy. Anything that has the power of doing work contains energy, that is, energy is the power of doing work. Now let us see the transformation of energy that goes on through the medium of a steam engine, a dynamo and a motor. In the first place, the energy in the coal is applied by combustion to producing the energy of steam under pressure and that is transformed to mechanical energy by the steam operating a steam engine. Again, by applying this mechanical energy of the steam engine to revolving the armature of a dynamo, electrical energy is produced which, when applied to an electric motor, is again transformed to mechanical energy. In each case the power of doing work is exhausted in producing another power of doing work. The problem of the greatest interest to the engineers of to-day is not how to accomplish each of these transformations, but how to do them with the greatest amount of efficiency.

We have seen that the operation of a dynamo is that an electric pressure is generated in a conductor when it is put in motion within the influence of a magnetic field. Electric motors operate on the principle that a conductor carrying a current has a tendency to move when placed within the influence of a magnetic field, on account of the mutual action of the lines of force of the current and of the field. These two laws are practically the reverse of each other, and therefore the action of dynamos and motors is a reversible one. A machine which is designed to be used as a dynamo to generate electrical action when driven by mechanical power may usually be used equally as well to generate mechanical power when driven as a motor by means of applying electric currents to it. The best dynamos very often make the best motors, because the same laws apply in either case and they operate under the same governing influences.

The essential features of a good dynamo or motor for general use are small magnetic reluctance in the magnetic circuit, good quality of iron, both in the field and in the armature core, armature core well laminated, as little waste as possible of power by heating, and good insulation of the windings from electrical contact with the iron cores or with the other turns of itself.

When the armature of a dynamo is revolved in a magnetic field so as to produce electrical action the lines of force belonging to the induced currents are attracted by the lines of force of the field and the force exerted is in a

direction which tends to stop the motion of the armature so that force has to be exerted to keep it revolving. Suppose in this machine that electric current is fed to the armature, then the same conditions regarding the force exerted would exist, and the armature would be put in motion by that force.

You will see it clearly by referring to Fig. 1. If the current be fed to the armature windings through the medium of the brushes and is flowing as indicated by the arrows, then lines of force will be produced which will be acted upon by the lines of the field and the armature will be caused to revolve. By reversing the direction of the current flowing through the armature, the lines of force or magnetism produced by it will be reversed, and then the direction of its rotation will be reversed. Another way to reverse the direction that the armature of a motor revolves is to reverse the current flowing through the field coils, which in turn reverses the lines of force or magnetism of the field and would have the same effect. Then to reverse the direction of a motor's motion it can be done by reversing the current feeding the armature or by reversing the current feeding the fields, never by reversing both.

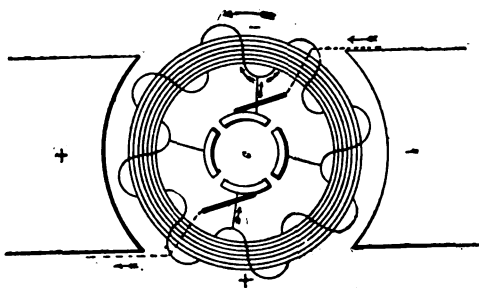


FIG. 1.

Referring again to Fig. 1, you will observe that if the armature be revolved in the direction it would move if operating as a motor, the operation would be the same as a dynamo, and induced currents would be set up in the coils of the armature and in a direction opposite to that flowing now indicated by the arrows. Why does this action not go on when the machine is working as a motor? It does, and the electric pressure which is thus set up in the armature conductors is in a direction opposite to the external source, and is called counter electric pressure or counter electro-motive force. It is proportional to the work which is done by the motor, and a useful electrical motor to-day which would operate without producing a counter electro-motive force is impossible of existence and must remain so unless the natural laws of electrical action and phenomena entirely change.

We will now take up the general instructions to be considered and followed in setting up and operating electric motors.

Machines should be placed in as dry a location as possible, and the cooler the location is the better. In considering the operation of belting, the position of the machine and the direction of rotation should be such that the strain of belt should come on the bottom and as nearly horizontal as practicable. This gives a more efficient transmission, with longer life to both belt and bearing, due to decreased strain on the belt. With a horizontal belt, the distance between centers of the pulleys should not be less than four times the diameter of the largest pulley on which it runs.

With vertical belts, or those nearly so, the distance should be at least six times the diam-

eter. To insure the best and quietest transmission the belt should be made endless, by cementing the ends together. Have belt only tight enough to avoid slipping, as too great a strain on the belt will produce unnecessary friction.

In constructing a foundation on which to place a machine it is very desirable to have it of brick or stone with cement; however this is not necessary in machines of small sizes, although the best in any case.

In assembling a machine care should be taken that all connections be clean and bright, and before fastening the bearing seats of the armature it should be observed that the surface of the armature is the same distance from the pole pieces at every part of its surface. A machine should always be set perfectly level, and always do this by placing a spirit level on the armature shaft; it is not advisable to level up a machine in any other way, because the framework may not be uniform in its distances from the shaft. Be sure that the brush holders are put on in the proper way, that is, in the direction in which the machine is to rotate.

Carbon brushes are generally used on motors, and before placing them in position it is a very good idea to boil them in paraffin for a few minutes or until no air bubbles rise to the surface of the wax. After they are cold scrape all the wax off the surface of the brushes so that they will make good electrical contact with the holders.

To set the brushes so that the point of contact will conform with the curve of the commutator, place them in the holders with a piece of sand paper, rough surface up, between them and the commutator; then by drawing the sand paper back and forth around the surface of the commutator, the contact face of the brush will be made to fit perfectly true to the surface of the commutator; when the sand paper is removed, clean brushes, brush holders and commutator thoroughly from carbon dust and dirt that may have collected on them, then adjust sufficient tension on the brushes to insure good contact, which should be not too great, however, or it will cause heating of the commutator.

Before starting be sure that oil is placed in the bearings and that the rings for circulating it work perfectly free. During the first week of running the machine the bearings should be carefully watched, and the oil removed every three or four days, replacing with clean oil, until the oil draws off clear from the bearings. and then oil may be left from two to three weeks without removing.

When a motor is started and the load is being thrown on watch the brushes to see if any sparking occurs. If they spark at full load and do not spark at no load, then move the position of the brushes back slightly, or opposite to the direction in which the armature is revolving. Set the brushes in the best position for non-sparking for the average load. This operation is the reverse in a dynamo, for if a dynamo sparks at full load and does not on no load the position of the brushes should be moved ahead, or in the direction that the armature is revolving.

To reverse the direction of a motor, reverse the connections on the brushes and set the brushes in an opposite direction.

In case the brushes chatter and appear not to run smoothly, rub a very little oil or vaseline on a canvas cloth, and wipe the commutator over with this cloth several times daily

and continue until the commutator becomes "glossy."

Fig. 2 will give an idea of the way to connect a switch and starting box for a motor circuit: however most every manufacturing company has apparatus especially designed for use in this capacity equipped with automatic rheostats and switches, and the sketch below is only given in case no special apparatus is to be used other than a switch and ordinary re-

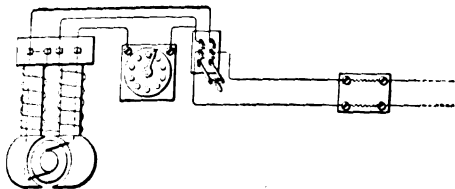


FIG. 2.

sistance box. Before starting always have all the resistance cut in the armature circuit and then turn the lever slowly, giving the motor time to reach speed as the resistance is being cut out.

Article No. 12 will be entitled "A Talk To Wiremen."

THE USE OF SEARCHLIGHTS IN NAVAL WARFARE.

Recent manœuvres in the Mediterranean, says a writer in the "Electrical Review," London, have shown searchlights to be a very effective means of defence when properly used, but the position from which they are used requires very careful consideration.

As regards the direct use of the light in revealing an approaching enemy, there is much to be said on both sides. In the case of a fleet steaming in company on a dark night, and attacked by torpedo boats, the only means of defence is obviously to turn all searchlights on, and endeavor to repel the attack by a sharp gun fire, unless there is any chance of eluding them under cover of the darkness.

Experiment has proved that in the case of a night attack by torpedo craft, the advantage lies very much on the side of the small craft, who can easily make out the dark silhouette of the upperworks of their huge adversaries, while they themselves are practically invisible. By turning on the searchlights, therefore, the chances are more equalized, for although the act reveals to the attacking boats the position of each ship, it at the same time gives a target for the guns.

Now the results of night firing at a target lit up by the searchlight are deplorably weak, and when this target happens to be a torpedo boat going at full speed, one is forced to admit that the chances of destroying her before she can discharge her torpedo are not great; still there is no alternative, and I think it is generally considered to be a bad case for the fleet attacked, for it must be remembered that, although several boats may be put out of action, if only one can get her torpedo in, the attack is successful. No one who has not tried to pick up a torpedo boat with a searchlight, or having picked her up, to keep the light on her, can have any idea what a difficult matter it is.

Of course, torpedo nets add very considerably to the strength of the defence, but they are not infallible.

The circumstance under which a torpedo attack is most to be feared, however, is that in which a ship, temporarily disabled, is lying

at anchor in port, awaiting repairs. I propose to give a brief sketch of the conditions under which experiments in this direction have been tried and the means of defence adopted.

A suitable port for the purpose having been chosen, the ship was anchored, her nets gotten out and placed, and all possible preparations made for the reception of an attacking flotilla, which had orders to deliver an attack on a certain night. The boats were totally unaware of what preparations would be made or what would be the position of the ship in the harbor.

The defence was prepared as follows: Searchlights were placed one on either side of the narrow entrance and guns were landed to form a small battery on either side, the searchlights were trained upon a buoy placed in the center of the channel, so that any boats entering the harbor were bound to pass through one or other of the two beams. All lights were extinguished in the ship, and patrol boats were sent out to give warning, by means of colored lights, of any approach, the color and nature of the light indicating the direction from which the attack was coming; another searchlight was placed in a boat moored off to the right front of the ship, throwing a diverging beam which would, by throwing a dazzling light in the eyes of the attacking party, screen the ship from view.

The night was ideal, heavy rain squalls and thick clouds combined to make the darkness intense, and beyond the two beams at the entrance of the harbor there was nothing to give the slightest clue to the attacking force.

About three hours after darkness had set in, a light from one of the patrol boats indicated an attack from the north, and soon after, a boat was seen to pass at full speed through the beam to the right of the harbor mouth, closely followed by a second. The screening light moored off the ship was now turned on, and a heavy fire directed at the first boat as she advanced, the light at the entrance endeavoring to pick up the second. At this instant two more boats passed through the beam to the left, one of which was picked up by the light in the upper top of the attacked ship, this light being turned on and the flash of the guns revealed her position at once to the attacking party, but not before the first boat, completely dazzled by the screening light, had run upon the rocks and put herself out of action. The remaining four boats fired their torpedoes, one of which missed altogether, while the other three went into the nets, two so close together that the first would have cleared a way for the second in reality by its explosion, but it was claimed that one of their boats had been under fire long enough to disqualify her in the opinion of the umpires, and so the attack was judged to have been in this instance unsuccessful according to the rules.

However, the fact still remains that in spite of the various searchlights, two boats had entered and discharged their torpedoes almost unobserved; it is a fact that is difficult to realize when we remember that they actually had to pass through the beam at the entrance before they could get in at all.

A comparison of the experiences of both parties shows the enormous importance of the position of searchlights. These on the water line completely destroyed the vision of the occupants of the boats while in the ray, though being of little value to the gunners, who could not distinguish any definite target through

the intense white light, whereas the highly-placed light from the fighting top, although making a better target for the gunners to direct their fire, also gave a good indication to the torpedo boats of the ship's position, so that, firing their torpedoes at a spot immediately below it, they were able to make pretty certain of getting their torpedoes home, while to those on whom the rays were not shining, the upper light and the flash of the guns were an excellent guide to enable them to determine how the ship lay, and direct their attack accordingly.

Colored glass shades were used by those in the boats with advantage. By their means the dazzling effect of the higher projectors could be very much reduced, but it was a different matter with the low ones, which cast an impenetrable glare that can only be compared to a dense fog, through which nothing was visible but the position of the projector itself and the flashes of the guns. When these flashes proceed from a shore battery, and the projector is removed from the ship, the effect is entirely misleading, and the boat taking the gunfire to be proceeding from the ship is led to discharge her torpedo at the shore or else, in attempting to get closer, dashes herself upon the rocks, as was the case with one of the boats in this instance; but, on the other hand, the gunners found it almost impossible to distinguish any object when attempting to fire from above the beam, though the boats showed up clearly enough when they were firing underneath it, as was the case with the light from the upper top.

The problem resolves itself into the question of whether it is worth while using the top light for the benefit of the gunners, and thereby revealing the ship's position more clearly to the boats, or whether it is better to trust entirely to the screening effect of the low light, in which case the ship's guns must remain silent and trust to the shore battery to do the work, bearing in mind that the shore battery is still under the very great disadvantage of firing through the screening light. It is, perhaps, difficult for those who have not experienced the conditions, to realize the effect of viewing an object through the beam of a searchlight.

A boat steaming through the light is only seen by the reflection upon her mast funnels, etc., and she therefore shows up as a white object against a somewhat paler background, the contrast is only made by the increased light in the beam due to reflection from the boat.

When the observer is so near to the projector that his line of vision enters the beam some distance ahead of the advancing boat, his eye receives the reflection of dust particles in a more concentrated part of the beam, and the light from them is proportionately greater, reducing the contrast very considerably, so that the boat becomes almost invisible. Hence we see that the searchlight itself should be as far removed from the gunners as possible before good gun practice can be expected.

The city council of Amsterdam has voted the sum of 6,000,000 guilders, or \$2,412,000, for an electric plant which is to furnish power for street cars, lighting, etc., for that city. A part of the supplies should come from the United States, says the United States Consul, and the sum voted is large enough to promote zeal in attempting to secure the work.

THE RATE QUESTION.*

BY HENRY L. DOHERTY.

At the last meeting of the National Electric Light Association, I read a paper entitled "Equitable, Uniform and Competitive Rates." I proposed a rather radical departure from our present methods, which seemed to me a logical solution of many of the difficulties which now confront us. Before adopting a rate system differing radically from all methods with which I was acquainted, I wished to obtain an expression of opinion from representative central station men which I thought would prove my plan either meritorious or otherwise. The discussion this paper provoked was not general, and no valuable points were developed. The sentiment at the meeting was unfavorable to the plan I outlined. The paper received but little comment from the electrical press, and was read in full only by those who chanced to obtain an advance copy published for the meeting. Since the Chicago Convention to the present date I have been kept busy answering correspondence regarding this rate system, and few of my correspondents seem to have gained from my paper a clear understanding of my views. The plan I then outlined seems to have grown greatly in favor, and many of its early and most pronounced opponents now express themselves as believing that it offers the best solution yet proposed towards the establishment of equitable and uniform rates.

After reading my former paper, I found it a hardship to answer all of the correspondence received, owing to the fact that many inquiries were made without having carefully read and considered my paper. To have answered some of them fully would have necessitated a repetition of much that had already appeared in printed form. I can not attempt another exhaustive treatise on this subject, but if any one is sufficiently interested in this matter to carefully read this paper, and also my former paper, which will be found in the published proceedings of the last Convention of the National Electric Light Association, I will not only willingly answer any inquiries they care to make, but will welcome any discussion of the subject by correspondence.

There are really but two distinct methods of charging for electric service, viz: First, flat rates. Second, meter rates.

An analysis of flat rates would mean, a definite charge for a fixed capacity, regardless of quantity of current used, within a limit of no use to constant use. This would work out to a minimum kilowatt rate, for current of the fixed rate, divided by the maximum consumption, to a maximum kilowatt rate, to infinity, if no current were used.

An analysis of meter rates would mean a fixed charge per unit of current sold, regardless of capacity demanded. In this case the station's cost to produce would vary from the very low cost per kilowatt hour, if total capacity were used continuously, to infinity, if no current were used. In the abstract, flat rates are preferable, as they give the station the advantage of the infinity end of the variation, but both systems seem to me almost absurd.

Theoretically, flat rates can be placed sufficiently high to absolutely protect the station from loss, but such rates would drive away much profitable business.

Meter rates cannot be placed so high but that loss may result. Even if a consumer agree to pay \$1 a kilowatt his consumption may be so small that his total payment will not equal the cost of reading his meter, keeping books for his account, core loss of transformer capacity and shunt loss of meter.

It is probably unnecessary to comment on the inequity of flat rates, but rates based solely on consumption, without considering the maximum demand that the station must be prepared to supply, are often even more inequitable. An analysis of the accounts of one central station, with which I am familiar, will illustrate the relative worth of different consumers supplied on a meter basis. A minimum bill of \$1 per month is now charged if no current is used. This means a minimum of \$1 per lamp per month, if the consumer has but one lamp, and .001 per lamp per month if the consumer has 1,000 lamps. At this particular station—

The average yearly bill is \$1.96 per lamp.

The minimum " " " .24 " "

The maximum " " " 38.46 " "

Assuming that the station represents an investment of \$20 per lamp wired up, this means that for these different classes of consumers, were all the consumers of one particular class, the lengths of time for our gross revenues to equal our investment—

For the average consumer 10 years and 3 months.

For the minimum consumer 83 years and 4 months.

For the maximum consumer no years and 6 months.

If the entire amount paid by the minimum consumer were clear profit, you would be earning but 1.4 per cent. on your investment. The consumer using the least current, may add just as much to your absolute maximum demand as any other consumers you have. I once cited the case of a church, which is generously equipped with lights, but which for several years past has used light but one night each year, and that night is Christmas Eve, or the preceding night.

Charging a fixed rate per kilowatt hour on a meter basis bears no relation to cost of service. Cases may sometimes be best illustrated by exaggerations. Suppose you should receive an application for a 2,000 light connection to be used as a relay in case of a breakdown of an isolated plant. At what rate per kilowatt could you afford to supply the applicant with current? This is the same problem which confronts us on a modified scale with each consumer.

Our costs are fixed by—

1. The number of consumers we have.
2. Distance from the station.
3. Capacity they demand.
4. Amount of their consumption.

Distance from the station is influenced by where we locate our station, and I see no reason why we should vary the cost to different consumers because of varying distance from the station, except in extreme cases. For lack of time I will drop this item of cost from further consideration and go on to the others.

There are certain costs, such as bill making and meter reading, which are entirely fixed by the number of consumers or meters, and many of our other costs are virtually fixed by the number of consumers or meters we must care for, such as meter testing and maintenance, rent, complaints and gratuitous work, superintendence and inspection. To cover such expenses as these I propose to have a fixed charge for each

consumer, regardless of his consumption or the size of his installation, provided no more than one meter is installed.

There are certain other costs which are fixed by the capacity demanded, such as interest on investment, transformer losses, maintenance, depreciation, etc. To cover such expenses as these I propose to have a fixed charge for each lamp the consumer's connection will permit him to demand, without regard to the number of lamps installed or amount of current used.

There are other charges which are fixed by the quantity of current generated, such as boiler fuel, lamp renewals, etc. To cover such expenses as these, I propose to charge a fixed and uniform rate per kilowatt hour consumed.

A moment's consideration will, I think, convince all of you that outside of boiler fuel and lamp renewals your operating costs would not be greatly increased if you operated 24 hours per day at your maximum load, nor would they be greatly diminished if you operated but 5 minutes per day at your maximum load, assuming, of course, that you stood ready to serve current at any time throughout the 24 hours should it be called for.

A charge for "readiness to serve" fixed on this basis, and a low kilowatt hour rate, will bring about many advantages to the central stations and protect them from loss, unprofitable patronage, and, I believe, will also protect them from undesirable legislation.

I recognize the fact that any change in methods of charging will cause trouble, if enforced suddenly on those consumers whose bills it will increase, but this system can be used in place of horizontal reductions in the rate now charged, and can reasonably be exacted from new consumers, and eventually made universal. Evolution—not revolution—must be the policy of all quasi-public corporations. In view of the fact that it will be inadvisable to enforce this system on old consumers who will be injured by its adoption, I propose to adopt it first as a substitute for all special rate consumers, and also for new consumers. Instead of dividing my expenses as they exist to-day and apportioning them amongst the consumers on this basis, I expect to adopt such charges as will benefit long hour, and therefore profitable, consumers to such an extent as can be readily compensated for by the additional business which can be secured with a lower rate per kilowatt hour. I will continue the rate cutting by small steps so long as I can protect the company's net earnings from marked shrinkage.

In one station where we have been experimenting we are convinced that it is profitable to supply consumers on this rate system, making a fixed charge of \$6 per consumer per year, plus \$1.80 per lamp demanded per year, to which is added 4 cents per kilowatt hour for current used, than to sell at a straight rate at 10 cents per kilowatt hour. It is needless to call attention to the fact that consumers will be much more liberal in the use of current when supplied at 4 cents than at 10 cents per kilowatt hour. My plan is to make all contracts for a year or more, allowing the consumer to contract for any capacity he may choose, the capacity to be increased whenever he desires, but not to be decreased except at the expiration of the period contracted for; the capacity to be limited by a suitable maximum demand cut out to prevent him from demanding more capacity than he contracts and pays

*Paper read before the Northwestern Electrical Association Convention, held at Milwaukee, Wis., Jan. 16-18, 1901.

for, and one-twelfth of the fixed charge to be included in each monthly bill.

This system, I believe, can be rendered absolutely uniform, both for light and power, and will prove more equitable than any other system.

A reduction of the kilowatt rate should be made for current supplied for power purposes to compensate for higher costs of lighting service, owing to the exact degree of regulation necessary and the cost of lamp renewals, which is a more important item than is generally believed.

I have no patents or copyrights on this system or the appliances its use demands. Anybody can use it as described or as they care to modify it.

The system is already in use in one central station with which I am connected and we are about to put it in use in two others. It has also been partially adopted by other central stations with which I have no connection and for which I have no authority to speak.

CENTRAL STATION SWITCHBOARD CONNECTIONS.*

BY J. A. SEAGER, A.I.E.E.

Among the minor points in central-station design is the arrangement of the cable connections to the switchboard from dynamos, battery and mains. Although many other considerations claim precedence, it is essential that these leads should be well arranged, as economy both in first cost and in running expenses can be obtained, and, what is more important, mistakes of electricians and wiremen due to complexity of connections must be avoided. Without going much into detail, the following elementary points may be noted. Two different considerations govern the arrangement of high and of low-tension connections. In the first, high insulation at every point is the chief aim of the designer. In the second, dealing with heavy currents, minimum copper resistance and good contact are the important objects. In high tension work stranded cable is almost invariably used, and in the majority of cases the cable is concentric. The insulating material should preferably not be rubber, as this deteriorates rapidly under such heat conditions as are found in cable trenches in stations. If used, the cable should be vulcanized. Whether the cable be lead sheathed or not depends on whether it is drawn into iron or pot tubes or clefted in a dry trench, or else laid in a trench imperfectly protected from moisture either from drains or escaping steam. The greatest care must be taken to prevent abrasion of the insulating material. Probably the best method for this purpose is to use a glazed stoneware tube, the cable being drawn into this. Next to this comes the employment of iron pipes. It should be remembered that there is a tendency for water to condense in the inside of these tubes and for grit to get in if they are left open, so that the ends should be closed with tarred wood plugs shaped to enclose the cable. The ends of the tube should be cupped outwards to prevent the edge of the tube cutting the insulation when the cable is bent about. If iron pipe is used for alternating current work, concentric leads are necessary, in order that the eddy currents generated by the "go" current may be eliminated by those of the "return." Iron pipe (which must, of

course, be "barfied" or else coated with tar) is cheaper than stone-ware. An alternative to iron or stoneware tube is, as mentioned above, a concrete trench. This is generally run along the dynamo ends of the foundations for the plant, and leads to the back of the switchboard or to a cable-room beneath the switch gallery. It is made of sufficient capacity to contain all necessary cables placed well apart from one another, say 5 in. from center to center with additional room for future extensions. In small stations cast-iron chequer plates fitting into wrought-iron seats are placed over the trenches. Care should be taken to see that these are watertight, as cleaners have a tendency to slop water very freely about the floors. In larger stations it is found to be better practice to make the trenches large enough for a man to pass through easily without touching wires, and to cover the top of the trench with a brick-work or concrete arch leveled to the floor at the top. It is useful to construct the trench at the same time as the foundations, building into the latter wrought-iron pipes having a gentle curvature leading from the top of the foundations to the trench, suitable for drawing in wire. Inside diameter of pipe to be not less than twice external diameter of cable; least radius of curvature of bend 3 feet. Before and after erection a mandrel of hard-wood $\frac{1}{4}$ inch less diameter than the internal diameter of the pipe, and, say, 3 inches long, should be drawn through the pipe to make sure that there are no burrs, fins, or other obstructions. If such exist, they must be removed with a steel tube scraper.

Practice varies as to the arrangement of cables in the trench. If this is liable to wet, lead-covered cable should be used, supported at intervals of about 15 feet on iron brackets affixed to the wall of the trench. Alternatively, wrought-iron pipe may be run along the trench and ordinary insulated cable drawn in. The method of combining trench work and iron piping is rather expensive. If the trench can be guaranteed dry, ordinary insulated cable can be fixed to the walls of the trench by means of wooden or pot cleats. A trench which is likely to receive water should have its bottom sloped down to the center of the passage, where there should be a gutter with a continuous slope of, say, 1 inch in 10 yards, leading to the station sump or to the drains. If corners are necessary in the trench, these should be rounded off wherever possible, as a sharp bend strains the insulation of a cable injuriously. If it is impossible to remove a sharp corner, a slight amount of slack must be allowed in the cable at the corner. Mechanical joints are not always satisfactory in high-tension alternating work, as the slightest slackness causes a dangerous arc. Care should therefore be taken to lead the cables to perfectly accessible positions where the terminals are under easy observation, both on the board and machines. This should be observed in the particular case of concentric feeders. It is common practice to bring the station end of the feeder into the middle branch of a T joint-box, and there connect it to two separate cables leading to terminals on the board. It is essential that all connections in the joint-box should be sweated, and no disconnecting links should be allowed there.

These should be placed in full view either on or at the back of the board.

In continuous-current work, where the power is transmitted at a low voltage, the magnitude of the current involves a heavy outlay

in copper. To minimize this the runs should be as straight as possible, and the cables should be kept as much as one horizontal plane as convenient. It would be found cheaper; in the case of large outputs, to insert the main machine and feeder switches in the direct horizontal line between bus bars and cables, and to work these switches by mechanical levers and link work from the gallery above, rather than to mount the switches on the board, thereby incurring extra expense in vertical runs. For copper cables inside a station connecting machines, battery etc., to board, a current density of 800 amperes per square inch should be adopted; for screwed or coned contacts about 500 amperes per square inch may be allowed, while a density of 400 amperes only should be taken for planed and scraped surfaces bolted together. Leads from regulating cells in a battery-room are often made of solid copper bar. A usual plan is to bring these away vertically from the cell terminals to about 8 feet above floor level, thus allowing the attendant a clear gangway all round the cells. The bars are then bent horizontal and passed through holes in a horizontal wood beam running parallel to the line of cells, which is in its turn supported either from ground or ceiling. In this way the rods are held up and prevented from touching each other. Where possible, the rods are led to the wall immediately behind the switch gallery, and are connected either to back terminals on the regulating switch or to a terminal board built into the wall. This is to prevent any gaseous acid escaping into the switch-room. Anti-sulphuric enamel is used to cover both the rods and any wood or iron work in the battery room. Milking leads must, of course, be flexible, and are of ordinary cable. It is found that a grey flintose rubber covering is the best protection for these. Any copper terminals or brasswork in the battery-room, if not enameled, should be protected by cases having glass fronts and rubber ring joints to exclude the acid spray. Switch gear and instruments should be kept out of the battery-room, unless it is absolutely necessary to have them there.

The use of paint as an element of safety is occasionally overlooked by station engineers. In high-tension stations, all connections at a high voltage should be painted red. All at a lower voltage—i.e., secondary connections—can with advantage be painted blue. If one side of the high-tension system is earthed, the cables on that side should be black. In a low-tension two-wire station, the negative side should be black, while the positive should be painted red. In a three-wire station the outers are red, the middle being black.

It is not overstating the case to say that the major portion of the complexity of a station (as far as the electrical part is concerned) is due to a muddled arrangement of connections. It is not enough to have all connections symmetrically arranged at the opening of the station, although this is essential. Sufficient room must be left in the design to allow for extensions. If alterations to plant are decided upon, the scheme of cable connections should be remodeled till the arrangement is simple. A temporary connection should never be allowed, in consideration of weeks of meritorious service, to become permanent. A cable festooned from pillar to post, tied up with bits of rope, is a sight more common than comely. An engineer who does not keep his cable connections simple and up-to-date should insist on his wireman taking out an insurance policy.

*From the "Electrical Engineer," London.

NORTHWESTERN ELECTRICAL ASSOCIATION CONVENTION.

The Ninth Annual Convention of the Northwestern Electrical Association was held at the Hotel Pfister, Milwaukee, Wis., on January 16, 17 and 18.

FIRST DAY'S SESSION—WEDNESDAY, JAN. 16.

The Convention was called to order by the President, Pliny Norcross, at 12 o'clock noon.

The minutes of the previous meeting were adopted as printed.

An adjournment was then taken until 2:30 P.M.

At that hour the Convention was called to order by the President who delivered his address. Among other things, referring to municipal ownership, he said:

"The 'fad' of municipal ownership of electric plants may sweep over the country as other socialistic, communistic, impracticable schemes have done, but it will in the end be a ruinous experience, and I firmly believe that there is not now so strong a sentiment in its favor as there was a year ago.

"As the matter of municipal ownership is more fully understood the desire for it will diminish.

"One reason for its adoption by many towns is the fact that unpleasant relations have grown up between the local plant and the municipality.

"The citizens are usually impressed with the idea that the local company is making too much money out of the business, while the company is confronted with the fact that the original outlay was not always a judicious one, and in all cases was very expensive.

"I well remember the time when carbons, dynamos, lamps, etc., cost three times as much as they do now.

"In every case the original plant was too small, and people who first invested were glad enough to get out of it at any sacrifice. Most of the plants in operation to-day stand upon the ruins of one or two earlier plants.

"The competing gas companies at first were somewhat disturbed by the new illuminant, and cut prices in order to hold their plants in operation. New electrical inventions then, as well as now, have compelled the abandonment of the earlier equipment.

"Cities are besieged with applications for apparently better contracts, and too often forced the old companies, which had struggled bravely to hold up against the rising tide, into bankruptcy.

"The city often gave franchises to new companies, or still worse, practically confiscated the existing plant by putting in one of its own. In this way many pioneer plants proved to be unfortunate investments. Most of these unfortunate facts could have been prevented by a little mutual concession."

The President's address was received with applause, and a vote of thanks extended to him.

The Secretary-Treasurer's report was read and accepted by a unanimous vote.

A committee consisting of Mr. F. A. Copeland, of La Crosse; Mr. E. L. Debell, of Sheboygan, and Mr. S. B. Livermore of Winona, was appointed by the President to consider the suggestions in the Secretary's report.

Mr. E. L. Debell, chairman of the Legislative Committee, then presented his report, which was in part as follows:

"Since this report was prepared and within the last twenty four hours there has already been one bill presented to the Wisconsin Legislature having as its object the repeal of the present license fee or percentage tax. It is probable that other bills will be presented to the Legislature following the recommendations of the tax commissioners. The tax commissioners in a partial report made to the Legislature state that with their present knowledge of the condition of affairs they recommend the license fee to be continued for the present, evidently to see how it works for the next year or two, but that the rate be raised. They propose that all companies, including street railway companies and combined street railway and lighting companies, shall pay 3 per cent. instead of 2 per cent. as at present, where the gross receipts of the company do not exceed \$50,000, and where they do exceed \$50,000, that a tenth of one per cent. be added for each \$7,500 of additional income, so that the smallest raise that would affect any street railway or street railway lighting company in the State would be 50 per cent. over the amount paid by them this last year. And if their gross receipts exceed \$50,000, the raise would exceed 50 per cent. according to the amount of their gross receipts. For instance if the gross receipts amount to \$65,000, the proposed tax would be 3 2-10 per cent., or an increase of 60 per cent. over the present rate, and so on, for every \$10,000 additional receipts over \$50,000 there would be two mills added to the 3 per cent., which is recommended as the minimum tax.

"As stated in this report the Association was represented at a hearing given by the tax commission at Madison on the 4th of September, and we urged them to the best of our ability, to retain the present license fee at the present rate of 2 per cent. It seems, however, that the commission concluded that the electrical properties were not paying a fair portion of the taxes. Hence their recommendation to the Legislature. We have done all we could before the tax commission and the only thing that remains to be done now is to appear before any legislative committee to whom may be referred any possible bills relating to the taxation of electrical properties."

A motion was put and carried that the report be adopted and a vote of thanks extended to the committee.

Letters of regret at being unable to attend the Convention from Henry L. Doherty, H. W. Frund and others were read by the Secretary.

The president then appointed as a committee to examine applications for membership, Mr. F. A. Copeland of La Crosse, Mr. W. P. Bragg of Monroe and Mr. W. H. Thorp of Beaver Dam.

As nominating committee the President appointed Mr. T. F. Grover of Fond du Lac, Mr. P. H. Korst of Hartford, Wis., Mr. Edward Daniell of Menominee, Mich., Mr. J. H. Gille of St. Paul, Minn., and Mr. G. L. Thayer, of Toledo, Ia.

The question of a summer meeting was then taken up.

Mr. Debell—I do not know whether a committee will be actually necessary in this case, but I make a motion that a summer meeting be held and that it be held in Sheboygan. (Laughter.)

The Secretary—I move that the matter of a summer meeting be referred to a committee of three to be appointed by the President. My ob-

ject in that is that it will facilitate the business and allow that committee to hear others on the subject, and I think that the report might be brought in at a definite hour where all can be present and discuss it.

Motion carried.

The President—I will appoint as members of the committee on summer meeting Mr. E. L. Debell, Mr. W. W. Low and Mr. S. B. Livermore.

The paper by Mr. Henry L. Doherty, of New York, was then read by Mr. Debell, the subject being "The Rate Question."

The paper was followed by one entitled "Practical Line Construction" by Mr. Loren W. Burch of Madison, Wis.

The reading of these papers was followed by a discussion on the subject of the tax on lighting plants.

This was followed by some miscellaneous discussions, after which the meeting adjourned until the following day.

THURSDAY, JAN. 17.

The Convention was called to order by President Norcross at 12 o'clock noon.

A communication was read from the Jamestown Electric Light Company asking for information regarding a gasoline arc lamp.

The President—That is a complimentary letter to this Association. It is to our credit that a man in Ohio, where they generally do not have troubles, or where they attend to them themselves, is anxious to get information regarding this gasoline arc lamp from us. What shall we say to him?

Mr. Gille—I think probably they refer to street lighting lamps.

The President—Yes.

Mr. Gille—We have been up against that same proposition and I think a good many other cities have.

The President—Give us what information you can on the subject.

Mr. Gille—The only thing so far as we have gone that we know against it is this, that the city has contracted for 600 of them as an experiment. In the city of Chicago they say that they have in the neighborhood of 18,000 of them, and I think it is a matter that ought to have some attention, even if it is brought up in this way by a letter. It is going to be a serious question in street lighting—I refer to incandescent gasoline lighting. They use a Welsbach mantel.

Mr. J. M. Hill of New York—I think the writer of the letter refers to a lamp which I myself saw in Cleveland some time ago. It looks like an arc lamp and it is claimed to be of 3,000 candle-power. I do not think that the correspondent in the letter refers to the Welsbach lamp which Mr. Gille refers to as being in Chicago.

The President—Is it a new lamp?

Mr. Hill—I saw it a year ago, and somebody paid quite a large sum for the rights in Ohio. This lamp had, I should say, five burners. Mr. Higgins says he thinks he has one in his town, Marinette. It is a regular arc lamp, but has no globe on it. The one that I saw had no Welsbach mantel at all.

Mr. Thayer—There seem to be two kinds of those street arcs; one is a form that takes the place of the old gas street lamp on a post and the other is the arc-lamp which looks like an enclosed arc-lamp. I have seen them on sale, but I know of only a single plant where they have been used for some time. I think it would be a good plan for all who are interested

in the matter to write directly to the towns where they have been used. I saw them in Nampa, Idaho, and I understand that they are using them in Pocatello, Idaho, and also in Boise City.

A lengthy discussion of lamps ensued, after which Mr. Livermore made a motion that a committee of three be appointed to examine into and report on the subject of the use of gasoline for lighting purposes. The motion was seconded and carried.

The report of the committee on summer meeting was then presented by Mr. Debell, chairman.

"The committee on summer meeting beg leave to report that they recommend the holding of a summer Convention in the last week in June, or at such other time as may be set by the committee appointed to take charge of it, and that the summer meeting be held at Sheboygan, Wis.

"As chairman of that committee and as a resident of Sheboygan, Wis., I wish to say that it will probably be as convenient a place to hold a summer meeting as the Convention can select. The climate is cool and pleasant at that time of the year, and while we have no particular attractions there, we have the lake which is enjoyed by a great many, nice grounds, and the entertainment features will be created by the entertainment committee."

After some discussion as to whether it would be advisable to hold the meeting in Sheboygan or Madison, the former place was decided upon.

Prof. W. E. Goldsborough, of Purdue University, then read a paper on the subject of "Synchronous Converters."

During the course of the reading of his paper Prof. Goldsborough said:

"You might say in constructing the machine you should make some conductors bigger than others because they have to carry more current than others. That, unfortunately, cannot be carried out for the reason that as the phase of the alternate current changes, that is, as you go from the 100 power factor in the machine to say a lag of 85 degrees, when you would get approximately 80 per cent. power factor, the conductor which has the minimum amount of current in it also changes."

At the conclusion of the reading of the paper Mr. Livermore offered the following motion:

I move that a vote of thanks be extended to Prof. Goldsborough for his able and interesting paper, which has made clear to the Convention some of the most intricate developments of the alternating current.

Motion seconded and unanimously carried.

An adjournment was then taken until 2:30 P.M. the same day.

THURSDAY—AFTERNOON SESSION.

President Norcross called the meeting to order at 2:30 P.M.

The Committee on Nominations presented the following report, recommending that the following officers be nominated;

President—E. L. Debell.

First Vice-President—S. B. Livermore.

Second Vice-President—W. Worth Bean.

Secretary and Treasurer—Thomas R. Mercein.

Directors—L. E. Kerns, Wisconsin; J. H. Harding, Indiana, and Charles Cuno, Wisconsin.

A motion was then made that the committee's report be accepted and that the recommendations therein be adopted, and that the Secre-

tary cast the unanimous ballot of the Association under suspension of the rules for the nominees, and that they be declared the duly elected officers of the Association for the ensuing year.

This was done and the nominees were declared duly elected.

Mr. Debell was escorted to the chair.

President Norcross—It gives me great pleasure to state that Mr. Debell has been elected to succeed me. I wish to thank the Association for the courtesies extended to me during the past year, and will turn over the duties and honors to my successor.

Mr. Debell (in chair)—I understand you have done me the honor to elect me President of this Association, and I sincerely consider it an honor and thank you very kindly for it and hope that I will do as well as our former Presidents. I doubt very much whether this will be so, but I shall certainly do whatever I can in this or any other capacity for the interests of this Association.

The Secretary—I move that a vote of thanks of this Association be extended to the retiring President, the Hon. Pliny Norcross, for his faithful and efficient services during the past year.

Seconded and unanimously carried.

The discussion of Prof. Goldsborough's paper was then taken up.

Mr. P. D. Wagoner next read a paper entitled "The Series Incandescent Lighting System of the Future," which was discussed by Messrs. Livermore, Wagoner, Debell, Hewitt and others.

Prof. D. C. Jackson, chairman of committee on correspondence schools, then presented a report on the subject of "The Trade Education of Central Station Employees."

Mr. Gille—I move that a vote of thanks be extended to Prof. Jackson and the other members of his committee for the very able paper, and that the committee be continued.

Motion seconded and unanimously carried.

An interesting discussion followed after which the meeting adjourned until 10 o'clock January 18.

FRIDAY MORNING, JAN. 18.

The meeting was called to order by the President, and there being little or no business to transact the Convention on motion adjourned.

American Institute of Electrical Engineers

The 150th meeting will be held at 12 West 31st street, New York City, Friday, January 25, at 8:15 P.M. A paper will be presented by Prof. W. Elwell Goldsborough, of Lafayette, Ind., on "Air Gap and Core Distribution."

A paper will also be presented by William B. Vansize, of New York City, on "A New Page Printing Telegraph," illustrated by lantern slides.

Applications have been received from the following candidates which will be acted upon February 22d: George L. Hoxie, Ithaca, N. Y.; Robert G. Brown, Brooklyn, N. Y.; Henry F. Sanville, Norman Leeds, New York; Guy L. Bagley, Yokohama, Japan; Calvert Townley, Boston, Mass.

The Executive Committee will meet at 26 Cortlandt street at 3 P.M., on Friday, January 25.

The plans for an electric railroad between Rome and Naples in Italy are about completed.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended January 16:

Antwerp, 30 packages, \$4,700; Argentine Republic, 139 cases, \$8,513; Australia, 112 cases, \$35,831; 26 packages electrical material, \$11,655; Brazil, 256 packages, \$15,483; 136 cases, \$63,575; Bristol, 1 case, \$50; British East Indies, 2 packages, \$15; 3 cases, \$2,434; British Guiana, 33 cases, \$868; British Possessions in Africa, 18 packages, \$1,691; British West Indies, 88 cases, \$2,434; 2 cases motor vehicle parts, \$328; Central America, 9 packages, \$324; China, 2 cases, \$132; Cuba, 60 packages, \$132; Danish West Indies, 10 packages, \$138; Dutch West Indies, 17 packages, \$852; Ecuador, 5 cases, \$109; Genoa, 30 packages, \$22,043; Glasgow, 298 packages, \$31,231; Hamburg, 127 packages, \$8,980; Havre, 74 packages, \$9,225; 2 packages auto vehicles, \$2,520; Japan, 256 packages, \$27,180; 1 automobile, \$750; Korea, 53 packages, \$2,555; Liverpool, 253 packages, \$9,926; 80 packages motor trucks, \$3,800; London, 163 cases, \$4,700; 188 packages, \$17,117; Mexico, 159 cases, \$8,236; 1 case auto parts, \$17; 2 packages, \$17; Newfoundland, 18 packages, \$2,475; Newcastle, 233 packages, \$8,400; 2 cases, \$150; Nova Scotia, 6 packages, \$236; Peru, 88 packages, \$3,474; Philippines, 187 packages, \$12,810; Rouen, 1 case, \$140; Southampton, 24 packages, \$127; U. S. Colombia, 7 cases, \$720; Venezuela, 10 packages, \$145.

PERSONAL MENTION.

Mr. Frederick A. Gilbert, the president and general manager of the Boston Electric Light Company, died suddenly in New York City January 18.

Mr. James R. Wilson was recently elected a director of the Royal Electric Company of Montreal, Can.

Mr. William A. Kahn, erecting engineer for the Edward P. Allis Company, recently returned to Milwaukee, Wis., from London, Eng., where he had been for a year and a half superintending the erection of the electric lighting system which has been installed there.

Mr. James R. Chapman, for several years the electrical engineer for the Union Traction Company, Chicago, has been appointed by Charles T. Yerkes to superintend the construction and equipment of the underground rapid transit system in London.

Mr. J. H. Whitaker was recently appointed city electrician of Tacoma, Wash., in place of O. N. Wiswell who resigned.

Mr. Edwin Holmes, the president of the Holmes Electric Protective Company and promoter of various electrical enterprises, died at his home, 32 West 52d street, in this city, January 17, after an illness of about a year.

Mr. T. C. McReynolds, of Kokomo, Ind., will succeed to the superintendency of the Kokomo electric light and street railway plants, W. O. French retiring.

INCORPORATIONS.

The National Improved Trolley-Harp Company, Indianapolis, Ind. Capital stock, \$5,000. Directors: Maurice Donnelly, Joseph W. Brooks, Peter Kretzer and Charles Glening.

The Plymouth Electric Light Company, Indianapolis, Ind. Capital stock, \$10,000. Directors: M. W. Simmons, Ellen B. Simmons and F. Celeste Simmons.

The Northern Ohio Electric Company, Defiance, O. Capital stock, \$25,000. Incorporators: W. D. Sherwood, E. Bartholomew, H. C. Warren and J. U. Merwin.

The North Coast Electric Company, Tacoma, Wash. Capital stock, \$25,000.

The Sullivan Electric Company, Sullivan, Ill.—to operate a light, heat and power plant. Capital stock, \$50,000. Incorporators: J. H. Baker, W. A. Steele and A. J. Patterson.

The Freehold Electric Light, Heat & Power Company, Trenton, N. J. Capital stock, \$10,000.

The Electric Mining & Milling Company, Fair Play, Col.—to operate in Park County. Capital stock, \$1,000,000. Directors: H. G. Chase, O. A. Young and T. L. Lintz.

ELECTRICAL PATENT RECORD.

LATTERS PATENT ISSUED JANUARY 8, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

- 665,404. Electromagnetic Brake. Edwin P. Carpenter, Pawtucket, R. I. Filed Sept. 9, 1899.
 665,450. Electric Brake for Vehicles. Joseph N. Mahoney, New York City, assignor to Price, Darling & Co., same place. Filed Feb. 12, 1900.
 665,540. Means for Generating Electricity from Car-Wheel Axles. Morris Moskowitz, New York City. Filed March 13, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

- 665,422. Globe-Holder for Arc-Lamps. Richard Fleming, Lynn, Mass., assignor to the General Electric Company of New York. Filed Sept. 25, 1899.
 665,541. Electric-Lighting System. Morris Moskowitz, New York City. Filed April 13, 1900.
 665,582. Lamp-Socket. Howard R. Sargent, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Aug. 14, 1900.
 665,657. Pendant for Gas, Electric, Oil or Other Lights. Harry Hateley, Erdington, Eng. Filed Dec. 8, 1897.

ELECTRICAL MACHINERY AND APPARATUS.

- 665,423. Electromagnetic Cut-Out. Richard Fleming, Lynn, Mass., assignor to the General Electric Company of New York. Filed Nov. 24, 1899.
 665,427. Electrolytic Apparatus. William T. Gibbs, Buckingham, Canada, assignor, by direct and mesne assignments, to the National Electrolytic Company of New York. Original application filed Sept. 9, 1895. Divided and this application filed Oct. 8, 1900.
 665,486. Dynamo-Electric Machine. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company of New York. Filed Oct. 25, 1900.
 665,492. Electric Switch. Charles L. White and Frank W. Cole, Chicago, Ill. Filed March 30, 1899.
 665,514. Electric Switch. William Ely, Providence, R. I. Filed Aug. 13, 1898.
 665,573. Transformer. Walter S. Moody and William L. R. Emmet, Schenectady, N. Y., assignors to the General Electric Company of New York. Filed Oct. 26, 1900.
 665,586. Direct Current Dynamo-Electric Machine. Wilhelm V. Siemens and August Roth, Berlin, Germany, assignors to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Jan. 6, 1900.
 665,667. Electrical Measuring Instrument. Llewelyn B. Atkinson, Cardiff, Eng. Filed June 8, 1900.
 665,798. Electrical Measuring Instrument. Camillo Olivetti, Ivrea, Italy. Filed Aug. 9, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

- 665,548. Telephonic System. Leon W. Pullen, Camden, N. J. Filed May 23, 1899.
 665,639. Telephone-Transmitter. Takeo Iwata, Tokio, Japan. Filed Oct. 25, 1899.
 665,788. Attachment for Telephones. David Laing and George M. Ferry, Duquesne, Pa. Filed May 2, 1900.
 665,834. Coin-Operated Magnet-Bell for Telephones. Heber R. Mason, Ludington, Mich. Filed June 16, 1899.
 665,848. Telephone-Switch. Nathan Bassett, Philadelphia, Pa., assignor to the Globe Telephone Manufacturing Company, same place. Filed May 3, 1900.

MISCELLANEOUS.

- 665,421. Machine for Restoring Insulated Wire. James B. Fleming, Detroit, Mich. Filed Jan. 15, 1900.
 665,426. Art of Obtaining Chlorates by Electrolysis. William T. Gibbs, Buckingham, Canada, assignor, by direct and mesne assignments, to the National Electrolytic Company of New York. Filed Sept. 9, 1895.
 665,449. Brush-Carrier. Carl W. Larson, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Oct. 23, 1899.
 665,539. Means for Generating Electricity from Axles of Locomotive-Trucks. Morris Moskowitz, New York City. Filed March 13, 1900.
 665,609. Electrical Battery. Charles B. de Lamarre, Biloxi, Miss. Filed Aug. 15, 1900.
 665,625. Primary Battery. Harry S. Amwake, Camden, N. J., assignor of one-half to Joseph H. Wilson and Abraham M. Geisinger, Philadelphia, Pa. Filed March 2, 1900.
 665,636. Electric Cable. Robert K. Gray, London, Eng. Filed May 23, 1900.
 665,664. System for Heating Conductors of the Second Class. Carl D. Raab, Kaiserslautern, Germany. Filed April 30, 1900.
 665,676-665,677. Junction-Box for Electrical Conductors. Edwin T. Greenfield, New York City. Original application filed July 9, 1900. Divided and this application filed Sept. 13, 1900.
 665,679. Electric Battery. Robert E. Hall, Bridgeport, Conn., assignor to the Waterbury Battery Company, Waterbury, Conn. Filed Dec. 15, 1899.

- 665,704. Electric Furnace. George S. Strong, New York City. Filed April 4, 1896.
 665,734. Type-Printing Telegraph. Adolf Franke, Berlin, Germany. Filed Jan. 18, 1899.
 665,782. Primary Battery. Henry K. Hess, Philadelphia, Pa., assignor to Herman J. Dercum, trustee, same place. Filed Jan. 11, 1899.
 665,783. Process of Regenerating Spent Elements of Primary Batteries. Henry K. Hess, Philadelphia, Pa., assignor to Herman J. Dercum, trustee, same place. Filed July 13, 1899.
 665,784. Apparatus for Regenerating Spent Elements of Primary Batteries. Henry K. Hess, Philadelphia, Pa., assignor to Herman J. Dercum, trustee, same place. Filed Aug. 9, 1899.
 665,901. Electric Burglar-Alarm. John W. Rough, Orleans, Ind. Filed April 2, 1900.
 665,810. Apparatus for Generating Electricity. Joseph Stretch, East Orange, N. J. Filed May 21, 1900.
 665,827. Manufacture of Storage-Battery Plates. John L. Creveling, New York City. Filed May 23, 1900.
 665,856. Electric Burglar-Alarm System. Emil Biedermann, and Leopold A. Heine, Chicago, Ill. Filed April 23, 1900.

DESIGN.

- 33,971. Electric Vehicle Body. Charles G. Burrows, Windsor, Conn., assignor to the Eddy Electric Manufacturing Company, same place. Filed June 27, 1900. Term of patent 7 years.

LATTERS PATENT ISSUED JANUARY 15, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

- 666,080. Electrically Controlled and Operated Railway-Switch. Philip B. Williams, Washington, D. C. Filed Oct. 11, 1900.
 666,177. Trolley-Finder for Electric Cars. Edwin S. Booth, Waterville, Me. Filed Sept. 19, 1900.
 666,183-666,184. Electromagnetic Brake. Francis L. Clarke, Pittsburg, Pa., assignor to the Westinghouse Air Brake Company, same place. Filed May 14, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

- 665,882. Electric-Arc Lamp. James A. Dalzell, Lynn, Mass., assignor to the General Electric Company of New York. Filed Dec. 7, 1898.

ELECTRICAL MACHINERY AND APPARATUS.

- 665,888. Cut Out. William L. R. Emmet, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed July 27, 1899.
 665,902. Dynamo-Electric Machine. Harry E. Heath, Windsor, Conn., assignor to the Eddy Electric Manufacturing Company, same place. Filed June 7, 1900.
 665,903. Rheostat. Edward M. Hewlett, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Nov. 13, 1900.
 665,928. Electrical Cut-Out. Charles G. Perkins, Hartford, Conn. Filed Jan. 17, 1900.
 665,943. Electric Cut-Out. John H. Trumbull, Plainville, Conn., assignor to Charles G. Perkins, Hartford, Conn. Filed April 2, 1900.
 666,105. Electric Igniter for Explosion-Motors. Charles E. Lufbery, Chauny, France. Filed Oct. 14, 1899.
 666,121. Means for Controlling Electric Motors. Montgomery Waddell, New York City, assignor, by direct and mesne assignments, to the General Electric Company of New York. Filed March 23, 1897. Renewed Jan. 18, 1897.
 666,122. Method of Controlling Electric Motors. Montgomery Waddell, New York City, assignor to the General Electric Company of New York. Original application filed Jan. 18, 1897. Divided and this application filed Dec. 13, 1900.
 666,196. Magnetic Stop. Frank P. Howe, Philadelphia, Pa. Filed July 3, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

- 665,874. Apparatus for Telephone Toll-Lines. Albert M. Bullard, Chicago, Ill., assignor to the Western Electric Company, same place. Filed June 7, 1899.
 665,923. Telephone Appliance. Frank R. McBerty, Downer's Grove, Ill., assignor to the Western Electric Company, Chicago, Ill. Filed Aug. 12, 1897.
 666,190. Germicide Device for Telephone-Transmitters. Adolph B. Larsen, Minneapolis, Minn., assignor of one-half to Frank F. Carlson, same place. Filed April 27, 1900.
 666,213. Telephone-Exchange Circuit and Appliance. George K. Thompson, Malden, Mass., assignor to the American Bell Telephone Company, Boston, Mass. Filed Feb. 9, 1900.

MISCELLANEOUS.

- 665,915. Process of Electrolytic Production of Nickel or Allied Metals. Moritz Kugel, Berlin, Germany. Filed March 24, 1900.
 665,950. Towing Apparatus for Boats. Herbert W. Alden, Hartford, Conn., assignor to the Electric Vehicle Company, Jersey City, N. J., and New York City. Filed Sept. 8, 1899.

- 665,954. Method of Manufacturing Electroplates. Warren C. Clouse, Kearny, N. J., assignor, by mesne assignments, to the Charles Craske Company. Filed Nov. 14, 1898.
 665,957. Receiver for Hertzian Electric Waves. Eugene Ducretet, Paris, France. Filed May 23, 1899.
 665,998. Acceleration Limiting and Recording Device. Albert G. Davis, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Sept. 29, 1900.
 666,003-666,004. Insulated Electric Conductor. William L. R. Emmett, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Aug. 19, 1899.
 666,153. Process of Producing Plates for Secondary Batteries. Charles Pollak, Frankfurt-on-the-Main, Germany. Filed Feb. 12, 1897.
 666,157. Electric Welding Apparatus. Adolph F. Rietzel, Lynn, Mass., assignor to the Thomson Electric Welding Company, same place. Filed Sept. 28, 1900.
 666,161. Electric Metal-Working Apparatus. Elihu Thomson, Swampscott, Mass., assignor to the Thomson Electric Welding Company, Lynn, Mass. Filed July 3, 1899.
 666,162. Transforming Apparatus for Electric Metal-Working. Elihu Thomson, Swampscott, Mass., assignor to the Thomson Electric Welding Company, Lynn, Mass. Filed July 3, 1899.
 666,185. Thermostatic Appliance for Boltwork. George L. Damon, Boston, Mass., assignor to Arolyn P. Damon, same place. Filed Feb. 9, 1898. Renewed Dec. 11, 1900.

COMMERCIAL PARAGRAPH.

Miniature Arc Lamps, consuming a small amount of current, giving nominal 800 cp., are now finding great favor with both central stations and isolated plants.

The Safford Arc Lamp Mfg. Co., Buffalo, N. Y., is now putting on the market a neat appearing and substantial lamp, a cut of which will be found below. It has been its aim, it states, to produce a perfect Enclosed Miniature Arc Lamp, that would take the place of clusters of incandescent lamps heretofore so commonly used, and greatly increasing the light from an equal amount of current and making a much handsomer looking fixture than it is possible to get with any combination of incandescent lamps.

The Safford Lamp is built on a double solenoid principle



SAFFORD MINIATURE ARC LAMP.

2½ amperes, 110 volts, D. C.
 14 inches over all.
 8 pounds complete.

with a balancing resistance in series with the arc. The solenoids are securely fastened to a light casting forming the framework of the lamp. The series resistance is held on porcelain insulation fastened to the cap of the lamp, and the series resistance wound spirally in grooves, which will not permit its lagging in case of excessive heating, due to a rise in the voltage. The company's trimming device is very simple, being only necessary to place the inner globe against the enclosing cap which is fixed, and two turns of the bottom carbon holder brings it to place, which makes an absolute enclosure, greatly increasing the length of life of the lamp, and making it possible to burn a very steady arc. Owing to the shape and thickness of the inner globe the breakage of globes, so common the company says in all other arc lamps, has been greatly reduced, the life of an inner globe being several months, if ordinary care is used in trimming. These lamps are made for both in and outdoor use on direct current circuits, and we understand that the excellent workmanship and handsome design has made them great favorites wherever used.

The company's new bulletins describing the types of this lamp can be had for the asking. The Safford Company is located at 297-299-301 Washington street, Buffalo, N. Y.

THE TELEPHONE WORLD.

Erie Telephone Changes.

At a special meeting of the Erie Telegraph & Telephone Company, held January 17 in Boston, new managers, representing the Old Colony Trust Company syndicate, assumed charge of the company's affairs. Charles J. Glidden resigned the office of president, and Charles A. Grant resigned as treasurer.

In his statement to the directors, President Glidden said, in part: "The new board of managers of the Erie Company to-day assume full control of the property known as the Erie Telephone system, the largest in the United States, operating in eight States nearly 145,000 telephone stations and more than 250,000 miles of wire, fully one-sixth of the Bell plant. More than \$21,000,000 has been spent on the property within the past three years."

The People's Home Telephone Company of Birmingham, Ala., which will compete with the Southern Bell Telephone & Telegraph Company, announces it will be ready for regular business on February 1. Already 'phones are put up in many subscribers' houses, and the company is assured of profitable support. The company has lines to all the suburban towns in the district, and in the larger places has exchanges, assuring the patrons a first-class service in the city and the towns within a radius of six or ten miles. The People's Home Telephone Company was organized with Birmingham and Youngstown, O., capital. It is incorporated at \$300,000, and all of its apparatus is first-class.

J. B. Ware, president of the Michigan Independent Telephone Association, says that the State meeting will be held in Lansing February 7. The object of the meeting is to provide means and discuss ways whereby the independent companies will be benefited. Another feature to be discussed that is of vast importance is the advisability of having a law passed establishing a low uniform rental for telephones for cities of a certain size, the amount to vary with the number of telephones in use.

The Gordon Telephone Company has let contracts for poles to be used in the construction of the extension line from Charleston to John's Island, Wadmalaw, Young's Island and Edisto, S. C. Other material for this line has already been ordered and it is expected there within the next two weeks. Actual work of construction will be begun February 1.

Articles of incorporation have been issued to the Northwestern Telephone Company, with headquarters at Neligh, Neb. The company is being organized by J. C. Jenkins, Thomas Kryger and H. B. Houser, and the principal portion of the capital stock, \$1,000, was subscribed there. A local exchange will be put in at Neligh as soon as the weather permits and lines run to neighboring towns.

The Southern Telephone Construction Company has recently been organized in Knoxville, Tenn., with W. O. Rhode and W. S. Roberts, of Knoxville, and C. L. Meyers, of Nashville, as executive officers. They have until recently been with the Cumberland Telephone Company in official capacities. They will build independent telephone lines all over the South and in Mexico.

The city of Bardwell, Ky., recently sold a telephone franchise to the American Telephone Company of St. Louis. That company has determined to enter the telephone field in Western Kentucky, and the exchange at Bardwell will be used as a relay station.

Stockholders of the Erie Telegraph & Telephone Company will hold a special meeting in this city on January 31, when a vote will be taken on the proposition to reduce the number of directors from twenty-five to fifteen. Three classes of directors will be elected, to serve from one to three years.

The Macomb County Telephone Company of Mt. Clemens, Mich., recently elected the following officers: President, G. R. Lovejoy; vice-president, J. A. Heath, Richmond; secretary, S. B. Spier. The company expects to have its exchange running by the 1st of April.

Jerome Herff, of Peru, Ind., has been granted a franchise for an independent city telephone system to oppose the Central Union, which now has 320 instruments. The members of the new company are said by Mr. Herff to be Peru capitalists.

A local telephone system is talked of by Wells, N. Y. residents. The Bell Company, it is claimed, charges exorbitant rates, and gives an unsatisfactory service.

There is an effort being made to extend the Louisa telephone system to Ashland, Va., if a sufficient number can be obtained who will take the service.

The annual meeting of the West Canada Telephone Company was held a short time ago at Trenton Falls, N. Y. The following directors were elected for one year: Josiah W. Jenkins, Charles H. Clark, Walter W. Martin, Wm. Wheeler, James E. Jenkins, Sewell E. Harvey and John Frinkle. Immediately after the meeting of stockholders the directors met and elected the following officers: Josiah W. Jenkins, president; Sewell E. Harvey, vice-president; Wm. Wheeler, secretary; Charles H. Clark, treasurer. The company which has been recently organized, intends to construct a telephone line from Trenton Falls to Morehouseville, taking in the towns of Hockley, Grant, Ohio, Wilmurt and Noblesboro, with branches therefrom to Poland, Wilmurt, Sheriff, Pine and G. Lakes. Part of the line has already been constructed.

News from Chester, Pa., states that the local telephone companies in the cities and towns in that part of the United States will combine for the purpose of furnishing a long-distance service. Nearly all of the towns and cities now have companies with simply a local circuit, as is the case with the Delaware County Telephone Company in Chester, and a union of all these companies under one management for long distance lines, it is said, will soon be effected. Efforts are being put forth to that end and it is believed that the accomplishment of the plan is not far distant. The Delaware County Company now has a large number of telephones in use in Chester and vicinity and some of the subscribers have been urging that Philadelphia connections be secured, as there is a constant demand for this service.

The independent telephone companies of Kansas, organized in Salina a short time ago, under the name of the Kansas Independent Telephone Association. S. C. Crummer, of Beloit, was elected president, and W. W. Dilworth, from the same city, secretary. About thirty delegates were present, representing 5,000 'phones and over 1,500 miles of toll line. Every part of the State except the extreme northeast and southeast portions was represented. One of the main objects of the meeting was the adoption of a uniform toll of 25 cents for a distance of not over forty miles on any line, and 10 cents for each additional forty miles or fraction thereof.

The directors and stockholders of the Plattsmouth, Neb., Telephone Company held their annual meeting recently, and declared a dividend of 10 per cent., payable March 1. The stockholders expressed themselves as more than satisfied with the business of the company and heartily pleased with their investments.

From Parkersburg, W. Va., comes the report that the stockholders of the West Virginia Western Telephone Company lately met in annual session. The fact that there were no changes whatever made in the directory of officials demonstrates that the stockholders were pleased with the condition and management of the affairs of the company, and that the patrons are satisfied with the service.

The Missouri River Telephone Association, composed of toll lines and local exchanges in Northwest Missouri, Southern Iowa and Eastern Kansas, was recently organized at a meeting held in the Citizens' Telephone Company's office in St. Joseph, Mo. About twenty exchanges were represented.

According to a Minneapolis, Minn., paper, the Stromberg-Carlson Telephone Company wants a hand in the proceeding to secure the appointment for a receiver for the Mississippi Valley Telephone Company and has filed an intervening complaint in which it claims to have about \$7,000 coming from the telephone concern.

The Pennsylvania Telephone Company has been granted a franchise to extend its lines through Hanover, Pa. The Bell people have been fighting for this franchise, but were never able to get the votes of a majority of the council for the reason that their competition, it was feared, might eventually exterminate the local company.

The Martin Telephone Company at Webster City, Ia., will put meters on its residence instruments, and a regular rate will be charged for 300 outgoing calls, no charge being made for incoming calls. In excess of the 300 calls per year the calls will be charged five cents each.

The Cumberland Telephone & Telegraph Company has opened up an exchange at Adams, Tenn., with about forty subscribers. Mr. W. J. Tomerlin, of Springfield, Tenn., is manager.

During a recent storm in St. Joseph, Mich., the Bell Telephone Company suffered great damage from the sleet and ice. The loss to the company is estimated to be \$3,000. New wires will probably be necessary.

Charles R. Lee, special agent for the Cumberland Telephone & Telegraph Company at Cheneyville, La., has recently been working up an exchange, to be connected with Bunkie in that State. This will give the long-distance connections to New Orleans, Alexandria, Memphis, and, in fact, with the entire country from that exchange when put in operation. Mr. Lee claims that the line will very soon be established, and when put in operation the company intends to extend its lines throughout the parish, so that all plantations desiring telephonic communication can have their wishes gratified. The citizens are well pleased with the prospect, and have subscribed liberally wherever called on.

At the recent annual meeting of the Saco River, Me., Telephone & Telegraph Company the following officers were elected: President, F. H. Hargraves; vice-president, Dr. Martin Coffin, Bar Mills; superintendent, treasurer and secretary, E. A. Hobson, West Buxton.

The Woodford Telephone Company has completed the elevation of a fifty-two line cable through Philippi, W. Va. This company will soon have connections made so that its service will be second to none in the State.

The local telephone exchange in Stockton, Kan., established by the Greenleaf Telephone Company is completed and in full operation with about eighty subscribers, and the probability of a material increase in the near future.

The annual report of the Chicago Telephone Company shows a net gain of \$193,888.75. The company will it is said, issue \$2,000,000 more stock—\$1,000,000 in April and the rest in October.

At Warsaw, Va., long-distance telephones are being put in the offices of the Northern Neck Telephone & Telegraph Company.

A new telephone exchange operated in connection with the independent system, will shortly be put in Solomon, Kan., a franchise having been granted by the council.

The Northern Indiana and Southern Michigan Telephone, Telegraph & Cable Company of LaGrange, Ind., has increased its capital stock from \$20,000 to \$50,000.

The stockholders of the Minier Telephone Company of Pekin, Ill., have decided to go on with the development of the system. The company has about \$15,000 invested.

A telephone company is being organized at Carleton, Neb., for the purpose of running lines among the farmers in that vicinity.

The Zenith Telephone Company will connect its lines with the private lines of the Duluth, Minn., & Iron Range Road.

The Telephone Exchange at Lebanon, Tenn., was completely destroyed by fire January 18.

TELEPHONE INCORPORATIONS.

The Cuba Telephone Company, Cuba, N. Y. Capital stock, \$12,000. Directors: Charles Richer, Clarence Richer and G. H. Richer, all of Cuba.

The Southern Tier Telephone Company, to connect Addison and Corning, N. Y., with Lawrenceville and Tioga, Pa. Capital stock, \$1,000. Directors: B. F. Toby and F. O. Camp, of Lindley, and M. William Manley, of Prescho.

The Warrensburg Telephone Company, Warrensburg, Ill. Capital stock, \$5,000. Incorporators: Mary P. B. Cowan, G. A. Randolph and C. J. Tucker.

The Nicholasville Home Telephone Company, Nicholasville, Ky. Capital stock, \$10,000. Incorporators: John H. Welch, J. D. Hughes and B. W. Arnett.

The Galesburg Union Telephone Company, Galesburg, Ill. Capital stock, \$10,000. Incorporators: John Poole, L. W. Cutler, L. R. Lockwood and F. L. Bills.

The Lafayette Home Telephone Company, Trenton, N. J. —to operate a telephone system in the State of Kentucky. Capital stock, \$250,000. Incorporators: Edward H. Barber and J. E. Bailey, Jr., of Wauseon. W. F. Saddler of Trenton, N. J., is the agent.

The Fayette County Telephone Company, La Grange, Tex. —to construct and operate a telephone line in Lavaca, Gonzales, Caldwell, Bastrop, Lee, Washington, Fayette, Austin and Colorado Counties. Capital stock, \$50,000. Incorporators: J. Schumacher, Leo Frede, H. C. Schumacher, W. E. and Charles A. Perlit.

The Mechanicsburg Telephone Company, Mechanicsburg, O. Capital stock, \$25,000.

GENERAL ELECTRICAL NEWS.

Lighting.

Aberdeen, S. D.—The board of county commissioners has decided to put in an independent lighting plant in the county jail.

Apalachicola, Fla.—The Cypress Lumber Company contemplates installing an electric light equipment to light its lumber mills.

Belington, W. Va.—The proposition to erect an electric lighting plant here to be owned by the city was carried by a large majority at a recent election.

Beresford, S. D.—The city council has granted to N. Crill of Elk Point a franchise to erect an electric light plant in this place.

Buford, Ga.—This city will erect an electric light plant.

Canfield, O.—At a recent council meeting a franchise was granted to C. C. & J. R. Fowler, D. E. Anderson and H. A. Ernst of Youngstown to establish and maintain an electric light plant.

Dothen, Ala.—This city will issue bonds for the erection of an electric light plant.

Dublin, Ga.—The Dublin Electric Light & Waterworks Company will make improvements to its plants.

Emporia, Va.—There is a movement on foot to have this town lighted by electricity at an early date. Arthur Satterwhite is the promoter of the enterprise.

Fond du Lac, Wis.—Business men of this city have organized a stock company for the purpose of installing an electric light plant. The company will be incorporated with \$10,000 capital stock.

Glidden, Ia.—J. and F. Everts have made a proposition to install an electric light plant here.

Grayville, Ill.—A special election will be held in this city on February 5 for the purpose of submitting to a vote of the people the question of purchasing the electric light plant.

Greenville, Ill.—A new electric light company is being organized at this place with \$10,000 capital. Mayor Ed. DeMoulin.

Gulfport, Miss.—The Gulf & Ship Island Railroad Company was recently granted a franchise to operate an electric light plant here.

Hinton, W. Va.—The Hinton Light, Ice & Fuel Company will erect an electric light plant of 2,000 incandescent and 85 arc lights. Address J. Leslie.

Humphrey, Neb.—Plans are being formulated for the erection of a new electric light plant in this city. The projectors are H. J. Breunig, J. E. Hugg and B. Martyn.

Hutchinson, Minn.—An ordinance was lately passed granting privileges to the Hutchinson Lighting & Manufacturing Company for the establishment of an electric light plant in this village.

Loveland, Col.—A franchise for ten years was given to L. J. Kelim to install and operate an electric light plant.

Magnolia, Miss.—Plans and specifications have been submitted by C. H. Jenks, supervising engineer for the new electric light plant to be erected in this city in the near future, for which bids will soon be advertised for. J. H. Price is president.

Millbury, Mass.—The Worcester & Blackstone Valley Street Railway Company directors recently voted to build a new power station of 1,000 horse power at this place to cost \$50,000.

Morris Run, Pa.—The Morris Run Coal Mining Company proposes putting in an electric light plant for commercial lighting.

Mount Holly, N. J.—The township committee has awarded a contract for lighting the streets by electricity to a new company to be formed by the citizens of this place.

Nashville, Tenn.—C. S. Brown, mechanical engineer, will design and supervise the construction of a \$150,000 municipal electric lighting plant.

New Ulm, Minn.—Aldermen Eibner and Manderfield and City Attorney Eckstein have been appointed to gather information about electric light plants for the benefit of the citizens, who will vote on the question of municipal ownership at the spring election.

Norfolk, Va.—The Norfolk Light, Heat & Power Company will erect a \$22,000 electric light plant.

Ord, Neb.—A representative of Fairbanks, Morse & Co. of Omaha is here arranging to put in an electric light plant.

Ravenswood, W. Va.—An election will be held January 24 to vote on the question of issuing \$7,000 in bonds to build a new electric light plant here.

Sublette, Ill.—The question of erecting an electric light plant is being agitated here.

Tarrytown, N. Y.—The trustees of this village have called for a special election to vote on the proposition, "Shall the village bond the town for \$35,000 to own its electric plant?"

Tuscumbia, Ala.—H. Barry of Huntsville has received a franchise for the erection of an electric light plant here.

Street Railways.

Bound Brook, N. J.—It is the intention of the Jersey Central Road to install an electric block signal system on its entire line between here and White Haven.

Canandaigua, N. Y.—Plans are being made for an electric road from this city to Palmyra. A new company is at the head of the enterprise, and is represented here by O. N. Crane.

Chatham, Ont.—Ypsilanti, Mich., capitalists propose building an electric road from Windsor to this place. Joseph Webb, representing the American capitalists, met the railway committee of the Chatham and the Kent County councils, and this joint committee passed a resolution promising to give the road all possible support.

Cincinnati, O.—Negotiations are under way for the construction of a traction line between this city and Dayton via Norwood, Pleasant Ridge, Montgomery, Foster's Crossing and Lebanon. L. C. Black, T. R. French and A. McCullough are the promoters.

Crawfordsville, Ind.—C. Fairbanks, H. C. Brubaker and F. Woods have petitioned the commissioners of Montgomery County for a franchise for an electric street railway line through the county. The road will run from Indianapolis to this place via Danville, North Salem and Ladoga.

Greenville, Pa.—The Greenville Street Railway Company has lately been incorporated with \$50,000 capital stock to build a trolley line in this place, a distance of five miles. J. H. McCafferty is president.

Lorain, O.—The stockholders of the Lorain & Cleveland Electric line contemplate the increase of the capital stock from \$700,000 to \$1,000,000. President B. Mahler announces the money will be used for improvements.

Puyallup, Wash.—F. E. Sander was recently granted a 50-year franchise by the commissioners of Pierce County to construct an electric railway across the Puyallup reservation.

Manufacturing.

Kittery, Me.—The National Fire Alarm Company has been organized here for the purpose of manufacturing electric fire alarm systems, with \$100,000 capital stock. The officers are: President, Clifford B. Sanborn, of Boston; treasurer, Walter J. Partridge, of Norwood, Mass.

New Haven, Conn.—The Rice & Baldwin Electric Company of this city has been formed for the purpose of manufacturing and dealing in electrical supplies and doing a general business in electrical work with a capital of \$10,000. The stockholders are William A. Rice, Edward M. Baldwin and William F. Simpkin of this city.

St. Louis, Mo.—The Imperial Electric Plating & Manufacturing Company was incorporated recently for \$5,000, held by J. S. McKinley, F. R. Harris and F. L. Morton.

Topeka, Kan.—The firm of Townsend & Dooley, of Des Moines, Ia., has decided to establish a factory here for the purpose of manufacturing lightning rods, static machines and X-ray machines.

Winsted, Conn.—Waldo L. Curtis, of this place, has organized the Hartford Motor Machine Company, with a capital stock of \$250,000. The company controls the patents on a motor street sweeper, which was invented

by John T. Collins of Hartford, and will engage in manufacturing and placing the sweeper on the market

Company Matters.

Berlin, Wis.—The Prouty Motor Company of Chicago, capitalized at \$100,000, wants to remove to this city.

Brockton, Mass.—The work and salesrooms of the Miliard Electrical Company were destroyed by fire a short time ago.

Buffalo, N. Y.—At the recent annual meeting of the Salamanca Waterworks & Electric Light Company the following officers were elected: President, Hudson Ansley; secretary and treasurer, H. O. Waite; superintendent, A. H. Krieger.

Chester, Pa.—John D. Rigg was re elected president of the Traction Company and the Chester & Delaware Street Railway at the annual meeting held in this city last week.

Waterville, N. Y.—The Waterville Electric Light & Power Company recently elected the following officers: H. B. Sweet, president, M. W. Terry, secretary and treasurer; J. W. Candee, M. W. Terry and H. B. Sweet, directors.

Power and Transmission.

Ashley, Mo.—The Laclede Power Company will erect a power house between here and O'Fallon to cost \$55,000.

Jackson, Mich.—The Boland interests which are building an electric railroad to Ann Arbor will erect a power plant which will cost \$250,000.

Los Angeles, Cal.—The United Electric, Gas & Power Company of this city has decided to extend its service to Redondo. It will run a line of transmission from here to Redondo, and give the people of the neighboring seaside town an all night service, and also furnish power for any purpose desired.

New Orleans, La.—E. Craig and others have incorporated the New Orleans Power House Company with \$50,000 capital stock to build and operate electric power plants, etc.

Automobiles.

Geneva, O.—A company with \$100,000 capital has been organized, to be known as the Geneva Automobile & Manufacturing Company. J. A. Carter is manager of the new enterprise.

Indianapolis, Ind.—Carl G. Fisher, an automobile and bicycle dealer in this city, has sold his business to C. Koehring & Bro. Mr. Fisher announces that he will associate himself with a manufacturer of automobiles in the near future.

Morristown, N. J.—Mayor Norman L. Fox and other prominent citizens here are inquiring into the cost of conducting an automobile line between this place and Madison. For this purpose a company will be organized with a capital stock of \$100,000.

New Haven, Conn.—This city is likely to be in the near future the home of another automobile manufacturing company. The Woods Motor Vehicle Company of Chicago has been looking over a good site in this city, and the managers have expressed themselves as pleased with the outlook.

Plainfield, N. J.—The Plainfield Automobile Company is perfecting its plans for the establishment of an automobile omnibus line to run over a route which will include many of the streets in parts of the city not now invaded by the local trolley system. The New York Motor Vehicle Company has become interested in the project and will furnish the carriages for the service.

Pottstown, Pa.—John R. Saylor and W. I. Grubb two manufacturers of this place, are each perfecting horseless vehicles of their own design.

Ripon, Wis.—Articles of incorporation of the W. E. Schaefer Manufacturing Company of this city were recently filed. This concern has a capital stock of \$40,000 and will make a specialty of the manufacture of automobiles, launches and bicycles. The chief stockholder is W. E. Schaefer.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: ord. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

NAME	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.	NAME	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Author's'd	Issued.					Author's'd	Issued.				
Albany, N. Y.—Jan 21						Hartford Conn.—Jan 21					
United Traction.....	100	\$5,000,000	\$5,000,000	1 1/2 % Q.	111 1/2	112 1/2	Hartford Street Ry. Co.....	100	\$4,000,000	\$200,000	8 % S., Oct.
(Consolidation of the Albany and Troy City Railway.)							Hartford & West Hartford RR.....	100	1,000,000	247,000	—
Allentown Pa.—Jan 21						Holyoke Mass.—Jan 21					
Allentown & Lehigh Val. Trac Co.....	100	4,000,000	1,800,000	—	18		Holyoke Street Ry. Co.....	100	400,000	400,000	8 % A., June
Bridgeport, Conn.—Jan 21:							Hoboken N. J.—Jan 21				
Bridgeport Traction Co.....	100	2,000,000	2,000,000	1 % Aug.	100		North Hudson Co. (N. J.) Ry. Co....	25	1,250,000	1,000,000	8 %
Baltimore Md.—Jan 21:							Indianapolis, Ind.—Jan 21				
United Railways & Elec. Co.....com.	50	24,000,000	12,000,000	—	10 1/2	10 3/4	Indianapolis Street Ry.....	100	5,000,000	5,000,000	—
Boston, Mass.—Jan 21							Laconia, Pa.—Jan 21				
New England Street Ry.....	25	5,000,000	1,001,925	1 % Q., Jan. 15,	—	—	Pennsylvania Traction Co.....	100	10,000,000	9,900,000	—
North Shore Traction Co.....com.	100	4,000,000	4,000,000	—	15	16	Laconia & Col. Electric Ry.....	100	—	87,500	—
North Shore Traction Co.....pfd.	100	2,000,000	2,000,000	8 % S. A. & O.	85	87	West End Street Railway.....	100	—	—	—
West End Street Ry. Co.....com.	50	10,000,000	—	8 % S. A. & O., '99	112	118	Louisville, Ky.—Jan 21				
West End Street Ry. Co.—S % pfd.	50	4,000,000	4,000,000	4 % S., Jan.	101	102	Louisville Ry.....com.	100	4,000,000	8,500,000	1 1/2 % S., April.
Boston Elevated R. R.....	100	10,000,000	—	3 1/2 % Aug. 99.	—	—	Louisville Ry.....pfd.	100	2,500,000	2,500,000	3 1/2 % S., Oct. 1.
Brooklyn N. Y.—Jan 21:							Minneapolis, Minn.—Jan 21				
Brooklyn City Ry.....	100	2,000,000	1,322,400	—	230	233	Twin City Rapid Transit.....com.	100	17,000,000	15,010,000	—
Brooklyn Rap. Transit Co., tr. certifi.	100	42,000,000	42,000,000	—	77 1/2	77 1/2	Twin City Rapid Transit.....pfd.	100	8,000,000	1,712,200	1 1/2 % Oct.
Brooklyn Heights Railroad.....	100	300,000	300,000	—	107	109	Montreal, Canada.—Jan 21				
Brooklyn City RR.....guar.	100	12,000,000	12,000,000	8 % Q., Jan.	247	249	Montreal Street Ry. Co.....	50	4,000,000	4,000,000	8 % S., M. & N.
Brooklyn, Queens Co. & Sub. RR.....	100	2,000,000	2,000,000	—	—	—	Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1 1/2 % S., J. & J.
Caney Island & Brooklyn RR.....	100	2,000,000	1,864,300	3 1/2 % Nov., '99.	325	332	Memphis Tenn.—Jan 21:				
Kings County Elevated.....	100	4,750,000	4,750,000	—	—	—	Memphis Street Railway Co.....	100	500,000	500,000	—
Kings County Traction Co.....	100	4,500,000	4,500,000	1 % July	—	—	New Haven, Conn.—Jan 21:				
Nassau Electric Railroad.....pfd.	50	6,000,000	6,000,000	—	75	80	Fair Haven & Westville RR.....	25	2,000,000	2,000,000	8 % S., Sept.
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000	—	—	—	New Haven Street Railway Co.....	100	1,250,000	1,000,000	2 1/2 % A., July
Brooklyn, B. & W. R. Railroad.....	100	1,000,000	1,000,000	—	—	—	New Haven & Centerville.....	100	700,000	800,000	—
Buffalo N. Y.—Jan 21:							Winchester Avenue RR.....	25	1,000,000	600,000	—
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	—	74	75	New Orleans, La.—Jan 21				
Buffalo Railway Co.....	100	6,000,000	5,970,500	1 % Q. Dec., '99.	99	100	Canal & Olabonne RR. Co.....	40	240,000	240,000	4 % S., July
Columbus O.—Jan 21							New Orleans & Carrollton RR.....	100	1,200,000	1,200,000	1 1/2 % Q., Oct.
Columbus Street Railroad.....	100	2,000,000	2,000,000	1 % Q., Feb.	35	42	New Orleans Traction Co new com.	100	—	—	—
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000	—	92	95	New Orleans Traction Co new pfd.	100	—	—	—
Charleston, S. C.—Jan 21							Orleans City RR.....guar.	100	2,000,000	2,000,000	8 % S., Jan.
Charleston City Ry. Co.....	50	100,000	100,000	8 % S.	—	—	New Or. City & Lake RR.....guar.	100	2,000,000	2,000,000	4 % S., Jan.
Enterprise City RR. Co.....	25	1,000,000	200,000	—	—	—	Orleans Railroad.....	50	500,000	180,000	1 1/2 % S., June
Chicago, Ill.—Jan 21							St. Charles Street Railway.....	50	1,000,000	1,000,000	1 1/2 % Oct.
Chicago City Ry. Co.....	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99.	258	265	New York—Jan 21:				
Chicago & South Side R. T. RR.....	100	10,225,000	10,225,000	—	—	—	Central Crostown RR.....	100	600,000	600,000	2 1/2 % Q.
Lake Street Elevated RR.....	100	10,000,000	10,000,000	—	9 1/2	10	Christopher & 10th Sts. RR. guar.	100	650,000	650,000	2 1/2 % Q., Oct.
Metropolitan West Side Elev. Ry....	100	15,000,000	7,000,000	Feb 28 1900.	27	29	Dry Dock, E. Bldg' & Battery RR.	100	1,200,000	1,200,000	1 1/2 % Q., Nov.
Met. West Side EL. pfd.....	100	15,000,000	9,000,000	—	30	31	Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000	2 1/2 % Q., Feb., 1900.
North Chicago Street RR.....	100	10,000,000	9,400,000	8 % Q., Jan.	200	210	Bleeker St. & Fulton Ry. Ry. guar.	100	900,000	900,000	2 1/2 % A., July
North Chicago City RR.....	100	10,000,000	9,400,000	—	197	200	Brooklyn & Seventh Ave. guar.	100	2,100,000	2,100,000	2 1/2 % Q.
South Chicago City Railway.....	100	2,000,000	1,608,200	—	10 1/2	10 1/2	Gen. Park, N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2 1/2 % Q.
West Chicago St. RR. Co.....	100	20,000,000	18,120,000	1 1/2 % Q., Feb.	96	96 1/2	Elighth Avenue RR.....	100	1,000,000	1,000,000	2 1/2 % Q.
Union Traction Ry. Co.....com.	100	1,250,000	634,900	25 %	18	18 1/2	42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	4 1/2 % Q.
Union Traction Co.....pfd.	100	2,000,000	2,000,000	5 % S.	49 1/2	50	Ninth Avenue RR.....guar.	100	800,000	800,000	—
Cincinnati, Ohio.—Jan 21:							Sixth Avenue RR.....guar.	100	2,000,000	2,000,000	—
Cincinnati Inc. Plane Ry.....com.	50	1,000,000	575,000	—	—	—	Twenty-third St. R. R. Co. guar.	100	600,000	600,000	4 1/2 % Q.
Cincinnati Inc. Plane Ry.....pfd.	50	150,000	150,000	—	—	—	Second Avenue RR.....	100	2,500,000	1,822,000	2 % Q., Jan.
Cincinnati, Newport & Cov. St. Ry.	100	2,000,000	2,000,000	—	75	76	Third Avenue RR.....	100	12,000,000	10,000,000	8 1/2 % p. sh. Feb.
Cincinnati Street Ry. Co.....	100	18,000,000	14,000,000	1 1/2 % Q., Jan.	124 1/2	125	42d St., Manhattan & St. Nich. Av	100	2,500,000	2,500,000	—
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,300,000	1 1/2 % Q., Jan.	126 1/2	127	Union (Huckberry) Ry.....	100	2,000,000	2,000,000	—
Cleveland, Ohio.—Jan 21:							Newark N. J.—Jan 21:				
Aron, Red. & Clev. Elec. Ry.....	100	1,000,000	1,000,000	—	48	50	Consolidated Traction Co. of N. J....	100	15,000,000	15,000,000	—
Cleveland City Ry.....	100	2,000,000	7,000,000	8 1/2 % Jan.	102	102 1/2	North Jersey Railway Co.....	100	6,000,000	6,000,000	—
Cleveland Electric Ry.....	100	12,000,000	12,000,000	—	88	88 1/2	United Elec. Co. of New Jersey..	100	504,000	504,000	1 1/2 % A.
Detroit, Mich.—Jan 21:							Pittsburg, Pa.—Jan 21:				
Detroit Citizens' Street Ry.....	100	2,000,000	1,350,000	—	100 1/2	—	Allegheny Traction Co.....	50	500,000	100,000	—
Fl. Wayne & Belle Isle Ry.....	100	1,300,000	1,300,000	—	175	—	Consolidated Traction Co.....com.	50	15,000,000	15,000,000	2 1/2 % Jan.
Rapid Railway Co.....	100	250,000	250,000	—	90	100	Consolidated Traction Co.....pfd.	50	9,478,850	—	8 % Nov.
Detroit Electric Railway.....	100	1,000,000	1,000,000	—	—	—	Central Traction Co.....	50	1,500,000	—	1 1/2 % Nov.
Windsor & Detroit River Ry.....	100	250,000	250,000	—	100	110	Citizens' Traction Co.....	50	8,000,000	—	6 % A.
Dayton O.—Jan 21:							Duquesne Traction Co.....	50	2,500,000	—	8 % A.
City Railway Co.....com.	100	1,500,000	1,470,000	1 1/2 % Q.	140	145	Federal St. & Pleasant Valley Ry..	25	1,400,000	—	8 1/2 % Nov.
City Railway Co.....pfd.	100	800,000	800,000	1 1/2 % Q.	170	—	Pgh., Allegheny & Man. Trac. Co....	50	8,000,000	—	2 1/2 % July
People's Street Railway.....	100	1,100,000	1,100,000	—	114	115	Pittsburg & Birmingham Trac. Ry..	25	1,500,000	—	1 % Aug.
							Pittsburg & West End Ry.....	50	8,000,000	—	1 % Oct.
							United Traction Co.....com.	50	17,000,000	—	5 % A., June
							United Traction Co.....pfd.	50	8,000,000	—	J. & J.

* Unlisted. † Ex-div.

The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.

^a Leased to Boston Elevated Railroad Company.

^b Owned by Brooklyn Rapid Transit Company.

^c Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

^d Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

^e Road owned by Kings County Traction Company; road leased to Nassau Electric RR.

^f Owned by Atlantic Ave. RR. and leased to Nassau system.

^g \$50 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; \$250.00 of stock owned by North Chicago Street Railroad Company.

^h Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

ⁱ 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$25.00 of stock owned by West Chicago Street Railroad Company.

^j Majority of stock owned by Chicago West Division Railway Company; 5 % on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.

^k Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex-div.

^a Leased to New Orleans Traction Company at 6 % on stock.

^b Leased to New Orleans Traction Company at 8 % on stock.

^c Leased to Central Crostown Railroad at 8 % on stock and interest on bonds.

^d Operating the former Met. Trac. system, that corporation having become extinct.

^e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

^f Leased to Houston, West Street & Pavyon Ferry—now Metropolitan Street Ry.

^g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

^h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1895, at \$215,000 per annum.

ⁱ Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

^j Leased to Metropolitan Street Railway for \$145,000 per annum.

^k Leased to Metropolitan Street Railway for 18 % on capital stock.

^l Controlled by Third Avenue Railroad by purchase.

^m Dividends of 1 1/2 % yearly guaranteed by Consolidated Traction Company.

ⁿ Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.

^o Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

^p Leased to Fort Pitt Traction Company for 6 % on \$3,000,000 capital stock.

^q Leased to Consolidated Traction Company for 4 % on capital stock.

^r Leased to Consolidated Traction Company for 7 % on capital stock.

TELEPHONE AND TELEGRAPH COS.

* Unlisted. † Paid in. ‡ Full paid. ¶ Outstanding. § Ex-div.
a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6% on stock per annum.
b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
c Practically all shares owned by Union Traction Company.
d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
e Leased to Electric Traction Company.
f Controlled by Frankford & Southwark Passenger Railway.
g Leased to People's Passenger Railway at \$5 per share.
h Majority of stock owned by People's Traction Company.
i Leased to Union Traction Company.
j Lease transferred to Union Traction Company.
k Leased to Union Traction Company at a rental of \$10,000 per annum in 1866-7-8, & \$20,000 in 1899-1900 and \$30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.
l Dividend of 10% guaranteed by Reading Traction Company.
m Dividend of 6% guaranteed by Reading Traction Company.
n Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

ELECTRIC LIGHT AND ELECTRICAL MFG. COOS

Boston, Mass.—Jan 21									
Fort Wayne Electric trust receipts..	25	.....	.....	.....	.....	.....	.....	115	125
†t. Wayne Elec Co. T. Sec. Series A.	25	.....	.....	.....	.....	.....	.....	15	25
*General Electric Co. [old] com.	100	40,000,000	80,460,000	2 ½ % Q., Aug., 1898.	.....	.....	.....	..	..
General Electric Co. [new]	100	18,276,000	18,276,000	1 ½ % Q., Apr., 1900	185 ½	185 ½	185 ½	22	28
T.-H. Elec. Co. T. Secur., Series C.	50	.....	.....	.....	.....	.....	.....	54	55
Westinghouse Elec. & Mfg. Co. com.	50	.....	148,700	.....	.....	.....	.....	88 ½	87
Westinghouse El. & Mfg. Co. pfd.	50	4,000,000	8,996,058	1 ½ % Q., Jan.,	.....	.....	.....	44 ½	45
Westinghouse El. & Mfg. Co. assent.	50	11,000,000	8,196,126	.....	.....	.....	.....	.....	.....
New York.—Jan 21									
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	.....	.....	.....	.....	119	120
*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1 ½ % Oct., '98,	.....	.....	.....	8	12
Edison Ore Milling Co. com.	100	.....	.....	.....	.....	.....	.....	..	..
Electric Vehicle Co. com.	100	.....	.....	.....	.....	.....	.....	..	..
†General Electric Co. [old] com.	100	40,000,000	80,460,000	2 ½ % Q., Aug., 1898.	.....	.....	.....	185 ½	185 ½
General Electric Co. [new] "	100	18,276,000	18,276,000	1 ½ % Q., Apr., 1900	41	41	41	110	126
Interior Conduit & Insulation Co..	100	1,000,000	1,000,000	.....	.....	.....	.....	.....	.....
† Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	.....	.....	.....	.....	.....
Pittsburg, Pa.—Jan 21									
Allegheny County Light Co.	100	500,000	500,000	J. & J.	168	172	172	..	..
East End Electric Light Co.	50	800,000	800,000	Q	.....	.....	.....	.....	.....
Philadelphia, Pa.—Jan 21									
Edison Electric Light Co.	100	2,000,000	.....	.....	144	144	144	80	84
*Electric Storage Battery Co. com.	100	8,500,000	.....	.....	81	87	87	18	18
*Electric Storage Battery Co. pfd.	100	5,000,000	.....	.....	80	80	80	.....	.....
Northern Elec. Light & Power Co..	10	550,000	550,000	.....	.....	.....	.....	.....	.....
Southern Elec. Light & Power Co..	10	187,500	187,500	.....	.....	.....	.....	.....	.....
Miscellaneous.—Jan 21									
Bridgeport (Conn.) Elec. Lt. Co....	25	500,000	.....	.....	47	48	48	20	21
Missouri-Edison (St. Louis) com.	25	.....	.....	.....	9	9	9	176	176
Eddy Electric Mfg. Co.	25	.....	.....	.....	6	6	6	195	195
Hartford (Conn.) Elec. Light Co....	100	850,000	.....	.....	118 ½	120	120	206 ½	208
Hartford (Conn.) Lt. & Power Co..	25	175,000	.....	.....	183 ½	183 ½	183 ½	105	105
New Haven (Conn.) Elec. Lt. Co....	100	100,000	.....	.....	.....	.....	.....	.....	.....
Narragansett (Prov. R.I.) Elec. Co.	50	1,200,000	.....	2 ½ % Q., Oct.,	98 ½	98 ½	98 ½	118 ½	120
Rhode Island Elec. Protec. Co.	100	.....	.....	.....	.....	.....	.....	.....	.....
Royal Elec. Co. (Montreal)	100	1,000,000	.....	1 ½ % Q.	206 ½	208	208	.....	.....
Toronto (Canada) Elec. Light Co....	100	1,085,000	1,085,000	1 ½ % Q.	183 ½	183 ½	183 ½	105	105
Thomson-Houston Welding Co.	100	.....	.....	8 ½ % S. Dec. 1,	.....	.....	.....	.....	.....
Woonsocket (R. I.) Electric Co....	100	.....	.....	.....	105	105	105	.....	.....

† On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to \$20,827,200, of which \$18,276,000 is common and \$2,551,200 preferred.

† Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent companies, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

Boston Mass.—Jan 21:									
American Electric Heating Co.....	50	10,000,000	.....	.....	—	—	—	—	—
Street Ry. & Illu'g Properties... pfd	100	4,500,000	1,248,700	\$2 p. sh.	—	—	—	—	—
United Electric Securities Co... pfd.	100	.....	1,000,000	\$8.50 p.sh.	—	—	—	—	—
New York.—Jan 21:									
Consolidated Electric Storage Co...	...	.....	.....	.....	8	12	—	—	—
Safety Car Heating & Lighting Co...	100	.....	.....	.....	150	185	—	—	—
Worthington Pump Co..... com.	100	5,500,000	5,500,000	.....	—	—	—	—	—
Worthington Pump Co..... pfd	100	2,000,000	2,000,000	1 % A	100	110	—	—	—
Philadelphia Pa.—Jan 21									
Electro Pneumatic Trans. Co.....	10	1,500,000	.....	.....	2	2 1/2	—	—	—
United Gas Improvement Co. scrip.	50	10,000,000	.....	.....	—	16	—	—	—
Welsbach Commercial Co..... com.	100	8,500,000	.....	.....	20 1/2	21 1/2	—	—	—
Welsbach Commercial Co..... pfd.	100	500,000	.....	2 % Q	78	78 1/2	—	—	—
Welsbach Light Co.....	5	825,100	.....	.....	40	41	—	—	—
Welsbach Light Co., Canada.....	5	500,000	.....	.....	1	1	—	—	—
Pittsburg, Pa.—Jan 21									
Carborundum Mfg. Co.....	100	200,000	200,000	.....	—	—	—	—	—
Standard Underground Cable Co...	100	1,000,000	1,000,000	Q	209	210	—	—	—
Miscellaneous. Jan 21									
Barney & Smith Car Co..... com.	100	.....	1,000,000	.....	18	16	—	—	—
Barney & Smith Car Co..... pfd.	100	.....	700,000	3 %	94	98	—	—	—
Billings & Spencer Co.....	25	.....	.....	.....	82	—	—	—	—
Consol. Car Heating Co.....	100	1,250,000	1,250,000	1 1/2 % Feb	89	85	—	—	—
Johns-Patt Co.....	100	.....	.....	.....	105	105	—	—	—
Pratt & Whitney Co..... com.	100	.....	.....	.....	2	4	—	—	—
Pratt & Whitney Co..... pfd	100	.....	.....	.....	40	80	—	—	—
Hillwell-Bierce Co..... com.	...	.....	.....	.....	—	80	—	—	—
Hillwell-Bierce Co..... pfd.	...	.....	.....	2 % Sept 1 '09	50	60	—	—	—
Shultz Mining Co.....	100	500,000	.....	.....	80	90	—	—	—
U. S. Car Co.....	...	.....	.....	.....	89	100	—	—	—
Unlisted.									

BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

ALBANY N. Y.							NEW ORLEANS LA.							NEW YORK.							TORONTO CANADA.							PHILADELPHIA.							PITTSBURG PA.							PROVIDENCE R. I.							ST. LOUIS.																											
Date of Quotation—Jan 21, 1900							Date of Quotation—Jan 21, 1900							Date of Quotation—Jan 21, 1900							Date of Quotation—Jan 21, 1900							Date of Quotation—Jan 21, 1900							Date of Quotation—Jan 21, 1900							Date of Quotation—Jan 21, 1900							Date of Quotation—Jan 21, 1900																											
NAME.	Amount.	Authorized.	Issued.	Due.	Interest periods.	Bid.	Asked.	NAME.	Amount.	Authorized.	Issued.	Due.	Interest periods.	Bid.	Asked.	NAME.	Amount.	Authorized.	Issued.	Due.	Interest periods.	Bid.	Asked.	NAME.	Amount.	Authorized.	Issued.	Due.	Interest periods.	Bid.	Asked.	NAME.	Amount.	Authorized.	Issued.	Due.	Interest periods.	Bid.	Asked.	NAME.	Amount.	Authorized.	Issued.	Due.	Interest periods.	Bid.	Asked.	NAME.	Amount.	Authorized.	Issued.	Due.	Interest periods.	Bid.	Asked.																					
The Albany Ry. Co. Cons. mtg. 5s. 850,000 427,500 1980 J. & J. 117 1/2							Canal & Claiborne RR. cons mtg. 5s. 150,000 150,000 1913 M. & N. 108 1/2							Atlantic Ave. (Brooklyn) Imp. g. 5s. 1,500,000 1,500,000 1984 J. & J. 95							Montreal St. Ry. 1st mtg. 5s. 2,500,000 800,000 1908 M. & S. 111 1/2							Continental Pass. Ry. 1st mtg. 5s. 850,000 810,000 1909 J. & J. 100							Birmingham, Knox & Allentown. 5s. 500,000 500,000 1981 M. & S. 111 1/2							Baden & St. Louis RR. 1st mtg. 5s. 250,000 250,000 1918 J. & J. 101 1/2																																		
The Albany Ry. Co. Gen. mtg. 5s. 750,000 875,000 1947 M. & N. 112 1/2							Oreosent City RR. 1st mtg. 5s. 5,000,000 5,000,000 1941 J. & J. 112 1/2							Atlantic Av. (Brooklyn) 1st mtg. 5s. 759,000 759,000 1909 M. & S. 107 1/2							Toronto St. Ry. 1st mtg. g. 4 1/2s. 4,550,000 2,200,000 1921 M. & S. 110							Empire Pass. Ry. 1st mtg. 7s. 800,000 700,000 1900 J. & J. 100							Central Traction Co. 1st mtg. 5s. 875,000 875,000 1980 J. & J. 111 1/2							Ones Ave. & Fair Gds Ry. 1st mtg. 5s. 1,818,000 1,818,000 1912 J. & J. 101 1/2																																		
Watervliet Turnpike & RR. 1st mtg. 5s. 850,000 850,000 1919 M. & N. 112 1/2							New Orleans City RR. 1st mtg. 5s. 415,500 899,000 1907 J. & D. 108 1/2							Bro'dway & 7th Ave. 1st cons. mtg. g. 5s. 12,500,000 7,650,000 1948 J. & D. 128 1/2							Citizens' Traction Co. 1st mtg. 5s. 1,500,000 1,500,000 1980 J. & J. 112 1/2							Federal St. & Pleasant Valley. Cons. 5s. 1,250,000 1,250,000 1942 J. & J. 110							Citizens' Railway Co. 1st mtg. 5s. 2,000,000 2,000,000 1907 J. & J. 109 1/2																																									
Watervliet Turnpike & RR. 2d mtg. 5s. 150,000 150,000 1919 M. & N. 112 1/2							N. Orleans City & Lake RR. 1st mtg. g. 5s. 5,000,000 2,599,500 1941 J. & J. 112 1/2							Broadway & 7th Ave. 1st mtg. 5s. 1,500,000 1,500,000 1904 J. & D. 104 1/2							Fed'l St. & Pleasant Valley. Cons. 5s. 1,250,000 1,250,000 1942 J. & J. 110							Comp. His. Un. De. & Mer. Ter. 1st 1,000,000 1,000,000 191 J. & J. 117 1/2																																																
Troy City Railway Co. 1st mtg. 5s. 150,000 150,000 1919 M. & N. 112 1/2							N. Orleans Railroad Co. Cons. mtg. 5s. 800,000 800,000 1917 J. & J. 112 1/2							Broadway & 7th Ave. 2d mtg. 5s. 500,000 600,000 1914 J. & J. 108 1/2																																																														
Interest guar. by Albany Ry. Co.							184,250 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.							Broadway Surface. 1st mtg. 5s. 1,125,000 1,125,000 1924 J. & J. 115 1/2																																																														
Principal and interest guar. by Albany Ry. Co.							1890,000 outstanding.							Broadway Surface. 2d mtg. 5s. 1,000,000 1,000,000 1905 J. & J. 106 1/2																																																														
Baltimore Md.							New York.							Brooklyn City RR. Co. 1st cons. mtg. 5s. 6,000,000 6,000,000 1941 J. & J. 116 1/2																																																														
Date of Quotation—Jan 21, 1900							Date of Quotation—Jan 21, 1900							Brooklyn City & Newtown. 1st mtg. 5s. 2,000,000 2,000,000 1889 J. & J. 115 1/2																																																														
United Electric Ry. Co. 1st mtg. g. 4s. 88,000,000 18,000,000 1949 M. & S. 102 1/2							Atlantic Ave. (Brooklyn) 1st mtg. 5s. 759,000 759,000 1909 M. & S. 107 1/2							Brooklyn Bath & W. E. RR. Gen. mtg. 5s. 1,000,000 448,000 1883 J. & J. 101																																																														
Income 4s. 14,000,000 14,000,000 1949 J. & D. 74 1/2							Atlantic Av. (Brooklyn) Cons. mtg. 5s. 8,000,000 1,965,000 1981 A. & O. 115 1/2							Bleecker St. & Fulton Ferry RR. 1st mtg. 7s. 700,000 700,000 1900 J. & D. 107 1/2																																																														
Baltimore City Pass. Ry. 1st mtg. g. 5s. 2,000,000 2,000,000 1911 M. & N. 113 1/2							Bro'dway & 7th Ave. 1st cons. mtg. g. 5s. 12,500,000 7,650,000 1948 J. & D. 128 1/2							Cent P'k. N. & E. R. RR. 1st cons. mtg. 4s. 1,200,000 1,200,000 1902 J. & D. 107 1/2																																																														
Baltimore Traction Co. 1st mtg. 5s. 1,500,000 1,500,000 1929 M. & N. 119							Broadway & 7th Ave. 1st mtg. 5s. 1,500,000 1,500,000 1904 J. & D. 104 1/2							Central Crosstown RR. 1st mtg. 5s. 250,000 250,000 1922 M. & N. 125 1/2																																																														
Baltimore Traction Co. Ext'n. & Imp. g. 5s. 1,250,000 1,250,000 1901 M. & S. 104 1/2							Broadway & 7th Ave. 2d mtg. 5s. 500,000 600,000 1914 J. & J. 108 1/2							Coney Island & Brooklyn RR. 1st mtg. 5s. 800,000 800,000 1908 J. & J. 101																																																														
Bal. Trac. Co. No. Balt. div. 1st mtg. g. 5s. 1,750,000 1,750,000 1942 J. & D. 121 1/2							Broadway Surface. 1st mtg. 5s. 1,125,000 1,125,000 1924 J. & J. 115 1/2							Dry Dock, E. B'd'y & B'd'y R. gen. mtg. g. 5s. 1,000,000 989,000 1902 J. & D. 117 1/2																																																														
Bal. Trac. Co. Coll. Trust 1st mtg. g. 5s. 750,000 750,000 1900 J. & J. 101							Broadway Surface. 2d mtg. 5s. 1,000,000 1,000,000 1905 J. & J. 106 1/2							D. Dock, E. B'd'y & B'd'y R. scrip 5%. 100,000 1,100,000 1914 F. & A. 102 1/2																																																														
Baltimore Traction Co. Convertible 5s. 800,000 800,000 1906 N. & M. 102 1/2							Brooklyn City RR. Co. 1st cons. mtg. 5s. 6,000,000 6,000,000 1941 J. & J. 116 1/2							Elgin Av. RR. Co. Cert. Indeb't. 6%. 000,000 1,000,000 1914 F. & A. 108 1/2																																																														
Central Pass. Ry. Co. 1st mtg. 5s. 96,000 117,000 1912 J. & J. 116 1/2							Brooklyn City & Newtown. 1st mtg. 5s. 2,000,000 2,000,000 1889 J. & J. 115 1/2							42d St., Man. & St. Nich. Av. 1st mtg. 5s. 1,500,000 1,500,000 1915 J. & J. 89 1/2																																																														
Central Pass. Ry. Co. Cons. mtg. g. 5s. 604,000 880,000 1922 M. & N. 119							Brooklyn Bath & W. E. RR. Gen. mtg. 5s. 1,000,000 448,000 1883 J. & J. 101							Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s. 5,000,000 5,000,000 1908 M. & S. 124 1/2																																																														
City & Suburban Ry. 1st mtg. g. 5s. 8,000,000 8,000,000 1922 J. & D. 116 1/2							Brooklyn Heights RR. 1st mtg. 5s. 250,000 250,000 1941 A. & O. 104 1/2							Metropolitan St Ry Co. g. m. cl. tr. g. 5s. 12,500,000 1,800,000 1907 F. & A. 120 1/2																																																														
Lake Roland Elev. 1st mtg. 5s. 1,000,000 1,000,000 1942 M. & S. 117							Brooklyn, Q's Co. & Sub'n. 1st mtg. 5s. 8,500,000 8,500,000 1941 J. & J. 112 1/2							Second Avenue Ry. Gen. cons. mtg. 5s. 800,000 800,000 1909 M. & N. 120 1/2																																																														
							Brooklyn, Q's Co. & Sub'n. 1st cons. 5s. 4,500,000 2,750,000 1941 M. & N. 107 1/2							Second Avenue Ry. Deb. 5s. 800,000 800,000 1909 J. & J. 118 1/2																																																														
							Brooklyn Rapid Transit. gold 5s. 7,000,000 5,181,000 1945 J. & J. 116 1/2							Steinway Ry. (L. I.) 1st mtg. g. 5s. 1,500,000 1,500,000 1922 J. & J. 116 1/2																																																														
							Bleecker St. & Fulton Ferry RR. 1st mtg. 7s. 700,000 700,000 1900 J. & D. 107 1/2							South Ferry RR. Co. 1st mtg. 5s. 850,000 850,000 1919 J. & J. 110 1/2																																																														
							Cent P'k. N. & E. R. RR. 1st cons. mtg. 4s. 1,200,000 1,200,000 1902 J. & D. 107 1/2							Third Avenue RR. 1st mtg. g. 5s. 5,000,000 5,000,000 1887 J. & J. 123 1/2																																																														
							Central Crosstown RR. 1st mtg. 5s. 250,000 250,000 1922 M. & N. 125 1/2							Twenty-third Street Ry. 1st mtg. 5s. 150,000 150,000 1909 J. & J. 106 1/2																																																														
							Coney Island & Brooklyn RR. 1st mtg. 5s. 800,000 800,000 1908 J. & J. 101							Twenty-third Street Ry. Deb. 5s. 150,000 150,000 1908 J. & J. 106 1/2																																																														
							Dry Dock, E. B'd'y & B'd'y R. gen. mtg. g. 5s. 1,000,000 989,000 1902 J. & D. 117 1/2							Union (Huckleberry) Ry. 1st mtg. 5s. 2,000,000 2,000,000 1942 F. & A. 118 1/2																																																														
							Elgin Av. RR. Co. Cert. Indeb't. 6%. 000,000 1,000,000 1914 F. & A. 108 1/2							Westchester Electric RR. 1st mtg. 5s. 500,000 500,000 1948 J. & J. 110 1/2																																																														
							42d St., Man. & St. Nich. Av. 1st mtg. 5s. 1,500,000 1,500,000 1915 J. & J. 89 1/2																																																																					
							Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s. 5,000,000 5,000,000 1908 M. & S. 124 1/2																																																																					
							Metropolitan St Ry Co. g. m. cl. tr. g. 5s. 12,500,000 1,800,000 1907 F. & A. 120 1/2																																																																					
							Second Avenue Ry. Gen. cons. mtg. 5s. 800,000 800,000 1909 M. & N. 120 1/2																																																																					
							Second Avenue Ry. Deb. 5s. 800,000 800,000 1909 J. & J. 118 1/2																																																																					
							Steinway Ry. (L. I.) 1st mtg. g. 5s. 1,500,000 1,500,000 1922 J. & J. 116 1/2																																																																					
							South Ferry RR. Co. 1st mtg. 5s. 850,000 850,000 1919 J. & J. 110 1/2																																																																					
							Third Avenue RR. 1st mtg. g. 5s. 5,000,000 5,000,000 1887 J. & J. 123 1/2																																																																					
							Twenty-third Street Ry. 1st mtg. 5s. 150,000 150,000 1909 J. & J. 106 1/2																																																																					
							Twenty-third Street Ry. Deb. 5s. 150,000 150,000 1908 J. & J. 106 1/2																																																																					
							Union (Huckleberry) Ry. 1st mtg. 5s. 2,000,000 2,000,000 1942 F. & A. 118 1/2																																																																					
							Westchester Electric RR. 1st mtg. 5s. 500,000 500,000 1948 J. & J. 110 1/2																																																																					

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	B. d.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—Jan 21, 1900						
Jefferson Avenue Ry.....1st mtg. 6s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Co.....1st mtg. 6s.	1,500,000	1,500,000	1911	F. & A.	108	109
Missouri RR. Co.....1st mtg. 6s.	1,000,000	700,000	1916	M. & N.	105	105
Mount City RR. Co.....1st mtg. 6s.	400,000	300,000	1910	A. & O.	100	102
People's RR. Co.....1st mtg. 6s.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 7s.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & St. L. Electric.....1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 6s.	2,000,000	2,000,000	1900	M. & N.	99%	100%
St. Louis & Sub. Ry.....1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5s.	800,000	800,000	.....	.....	80	84
Southern Electric Ry.....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	105	105
Taylor Avenue St. Ry.....1st mtg. g. 5s.	500,000	500,000	1912	J. & J.	116	118
Union Depot RR. Co.....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100%
Union Depot RR. Co.....Cons. mtg. 6s.	8,500,000	1,787,000	1912	J. & J.	121	125
†Controlled by St. Louis RR. Co.						
†Controlled by Union Depot RR. Co.						
†Controlled by Lindell RR. Co.						
†\$300,000 in escrow to retire 1st & 2d mtg.						
†\$500,000 in escrow.						
†\$300,000 in escrow to retire 1st mtg. bds.						
San Francisco Cal.						
Date of Quotation—Dec 1900						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & N.	.....	117
Geary St., Park & Ocean RR.....1st mtg. 6s.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. g. 5s.	8,000,000	8,000,000	1918	J. & J.	120%	.....
Metropolitan Ry. Co.....1st mtg. 6s.	200,000	.....	.....	.....	.....	.....
Omnibus Cable Co.....1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	120%	.....
Park & Cliff House RR.....1st mtg. 6s.	850,000	850,000	1912	J. & J.	105%	107
Park & Ocean RR.....1st mtg. 6s.	250,000	250,000	1914	J. & J.	115	.....
Powell St. Ry.....1st mtg. 6s.	700,000	700,000	1912	M. & N.	.....	125
Outer St. Ry. Co.....1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	.....	.....
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Jan 21, 1900						
Belt Ry. Co.....1st mtg. 5s.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 6s.	500,000	500,000	1914	A. & O.	125	.....
Washington & Soldiers' Home.....1st mtg. 6s.	300,000	300,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	.....	.....
†\$50,000 in escrow to retire 1st mtg. bds.						
Miscellaneous.						
Date of Quotation—Jan 21, 1900.						
Bridgeport Traction Co.....1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 5s.	5,000,000	8,542,000	1901	F. & A.	118	.....
Buffalo (N. Y.) Ry. Co.....1st cons. m. 5s.	4,000,000	8,000,000	1908	M. & N.	104	105
Croton town St. Ry. (Buffalo).....1st mtg. 5s.	8,000,000	2,866,000	1902	M. & N.	112	113
Columbus (O.) St. Ry.....1st cons. g. 5s.	8,000,000	2,281,000	1902	J. & J.	115	.....
Consolidated Traction (N. J.).....1st mtg. 5s.	15,000,000	12,965,000	1908	J. & D.	111%	111%
Croton's St. Ry. (Colu's, O.).....1st mtg. 5s.	2,000,000	572,000	1908	J. & D.	115	115%
Denver City Cable Ry.....1st mtg. g. 5s.	4,000,000	8,800,000	1920	J. & J.	20	.....
Denver Con. Tram'g Co.....Cons. m. g. 5s.	4,000,000	922,000	1908	A. & O.	80	85
Louisville (Ky.) Ry.....1st cons. mtg. g. 5s.	6,000,000	4,981,000	1900	J. & J.	119	119%
Minneapolis St. Ry.....1st cons. mtg. g. 5s.	5,000,000	4,050,000	1919	J. & J.	110%	110%
No. Hudson Co. Ry. (N. J.).....Cons. mtg. 5s.	8,000,000	2,878,000	1928	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.).....2d mtg. 5s.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.).....Deb. 6s.	500,000	489,000	1902	F. & A.	.....	.....
Paterson (N. J.) Ry.....Cons. mtg. g. 5s.	1,250,000	1,000,000	1901	J. & D.	.....	.....
Paterson (N. Y.) Ry.....1st mtg. 5s.	8,000,000	2,000,000	1900	A. & O.	.....	.....
St. Paul City Ry.....Cons. g. 5s.	5,500,000	4,298,000	1907	.....	105%	105
St. Paul City Ry.....Deb. g. 5s.	1,000,000	1,000,000	1900	.....	108	.....
†\$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
†\$600,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
†\$750,000 in escrow to retire bonds of O. St. RR. Co.						
†\$87,000 in treasury.						
†\$900,000 reserved to redeem prior liens						
†\$420,000 in escrow.						

*With Int' res

ELECTRIC LIGHT AND ELECTRIC MFG. COs

Boston, Mass.						
Date of Quotation—Jan 21, 1900						
Delaware Gas Lt. Co.....1st m. 5s. g.	800,000	800,000	.....	J. & J.	108	108
Edison Elec. Illuminating Co., Boston.....	2,425,000	.....	.....	Quar.	187	.....
General Electric Co., gold coup. deb. 5s.	10,000,000	8,750,000	1923	.....	116	.....
Pittsburgh Pa.						
Date of Quotation—Jan 21, 1900						
Allegheny County Light Co.....6s.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co., Scrip. 6s.	195,570	.....	.....	M. & N.	.....	.....
Miscellaneous. —(Jan 21, 1900.)						
Edison El. Ilig. Co. (N. York) 1st m. 5s.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilig. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1908	.....	124	.....
Edison Elec. Ilig. Co. (Brooklyn).....	5,300,000	5,000,000	1940	.....	122%	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	100	101
Kings Co. El. Lt. & Pow. Co., 1st mtg. 5s.	2,500,000	.....	1907	A. & O.	120	122
Kings Co. El. Lt. & Pow. Co., pur. money 6s.	5,176,000	.....	1907	A. & O.	120	122
Milwaukee El. Ry & Lt. Co., 1st cons. g. 5s.	8,000,000	.....	.....	F. & A.	102%	.....
United Elec. Light & Power Co. (N. Y.).....	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous						
Date of Quotation—Jan 21, 1900						
American Bell Telephone.....4s.	.....	.....	1908	F. & A.	100%	101
Northwestern Telephone Co.....7s.	.....	.....	.....	.....	114	116
N. Y. & N. J. Telep. & Telg. Co., gen. mtg. 5s.	.....	.....	1911	J. & D.	108	108
Chesapeake & Potomac Teleph. Co.....5s.	.....	.....	.....	.....	.....	.....

ALLIED INDUSTRIES.

Miscellaneous						
Date of Quotation—Jan 21, 1900						
American Electric Heating.....7s.	500,000	500,000	.....	.....	.....	.....
Armington & Sims Engine Co.....6s.	.....	.....	.....	.....	.....	.....
Barney & Smith Car Co.....6s.	.....	.....	1922	J. & J.	106	107
Carborundum Mfg Co.....6s.	.....	.....	1904	J. & D.	.....	.....
Worthington Pump Co.....6s.	75,000	.....	.....	.....	118	127
Unlisted						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16¼c.; Lake, 16½@17c.; casting, 16½@16¼c.

New stock to the amount of \$5,000,000 will be issued by the Chicago City Railway.

As we go to press (Tuesday, 2:30 P. M.) the announcement of the death of Queen Victoria did not affect the stock market to any appreciable extent.

Stockholders of the Philadelphia Electric subsidiary companies will hold their annual meetings February 4.

The annual meeting of stockholders of the United Power and Transportation Company will be held February 5.

The directors of the National Carbon Company have declared the regular quarterly dividend of 1½ per cent. on the preferred stock.

The regular quarterly dividend of 2 per cent. has been declared on Bell Telephone Company, of Philadelphia, stock, payable January 28.

The Twin City Rapid Transit directors declared a dividend of 1½ per cent. on common stock, payable February 15. Books close February 9, and reopen February 18.

The South Brooklyn Railway Company reports for the quarter ended December 31, 1900: Gross earnings, \$1,377; net income, \$566; cash on hand \$323; profit and loss deficiency, \$2,610.

The annual report of the Philadelphia & West Chester Traction Company, just issued, shows gross earnings for the year ended December 31, 1900, of \$93,515, an increase over the preceding year of \$7,532.

The Worcester (Mass.) Traction Company stockholders have added to the board of directors A. George Bullock, representing Boston capitalists interested in the consolidation of the street railroads of that vicinity.

It is stated on good authority that a large part of Telegraph, Telephone & Cable Company of America loans were paid off recently and that the remaining indebtedness is only about \$300,000, owed in New York and Philadelphia.

Directors of the Chicago City Railway have authorized the issue of \$4,500,000 at par, which will be offered to stockholders. With new issue amount outstanding will be \$18,000,000. Stock is issued to pay off company's 4½ per cent. bonds.

The Massachusetts Railroad Commissioners have approved the purchase of the Globe Street Railway by the Brockton Street Railway, by changing the stock share for share, amounting to \$1,440,000, and assuming the debts of the absorbed company.

The United Gas Improvement Company, of Philadelphia, and the Connecticut Lighting & Railway Company have absorbed the Westport Electric Lighting Company and the Westport Water Company. It is understood that the stock sold at par and the bonds at a premium.

The recent advance in General Electric stock to \$200 per share has naturally resulted in the exchange of stock for the 5 per cent. debenture bonds, says the Boston "News Bureau." To date about \$3,600,000 bonds have been surrendered, leaving \$1,700,000 outstanding.

A stockholders' meeting of the Cincinnati Street Railway has been called for February 21, to vote on a lease to the Widener-Elkins syndicate. A proposition will be made to guarantee to stockholders annual dividends of 5½ per cent. the first year, 5¼ the second, 5¼ the third and 6 per cent. yearly thereafter.

The Chicago Telephone Company reports for the year ended December 31: Gross earnings, \$3,129,238; operating expenses, \$2,258,781; net earnings, \$870,457. During the year the company issued \$2,000,000 new stock. It will issue the same amount this year, bringing the total capital up to \$9,000,000. The additional capital will be offered to stockholders at par.

At the directors' meeting of the Erie Telegraph & Telephone Company on January 17, President Glidden's resignation was accepted. He remains in the company as general manager. A new executive committee was elected as follows: Philip Dexter, Wm. Endicott, Jr., Reginald Foster, Francis R. Hart, W. De Latta. Walter Abbott, was elected treasurer, vice Chas. A. Grant, who resigned.

At the annual meeting of the Toronto Electric Street Railway Company, on the 16th inst., it was reported that the gross earnings for the past year were \$1,501,000, as compared with \$1,333,542 the previous year. The operating expenses were \$775,980, or 51 per cent. of the gross, as compared with \$650,324, or 48.8 per cent. of the gross in 1899. After paying all fixed charges, there remained a net profit of \$454,102, from which dividends of \$240,000 or 4 per cent. on the capital were paid. The city pavement charges were met and \$150,162 put to the credit of the profit and loss account. Since 1892, the company has spent over \$1,000,000 of the surplus earnings on improvements to the property. The increase in the price of coal and advances in the wages of employees were the causes of the increase in the operating expenses last year.

Figures of copper production and our exports of the metal for the year 1900 are now complete. The domestic output of copper as well as the shipments abroad were the largest on record. The figures are notable as showing an abnormally small increase in the domestic production—2.5 per cent., which compares with a 10 per cent. normal increase—and an abnormally large increase in the exports to foreign countries—33.2 per cent. There was consumed in the United States but 40 per cent. of the amount of copper produced here, the remaining 60 per cent. having been shipped abroad. For the closing months of the year, November and December, our exports of copper show a material falling off from the figures for the same months in 1899. The exports for these two months in 1900 amounted to 20,731 tons against 26,359 for the same months in 1899. Another important fact to be noted is that the European production for December at 8,483 tons was the largest for any one month in the history of the industry.

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EDITORIAL NOTES.

The Effect of the Atmosphere on Aluminum Conductors.

The use of aluminum wire for carrying electric currents is becoming more and more general in spite of the fact that it cannot be so easily joined together or soldered as copper. The Niagara Falls Power Company has about completed an aluminum transmission line between Niagara Falls and Buffalo consisting of thirty-seven strands of 300,000 circular mils, which will carry current at a pressure of 22,000 volts. Aluminum transmission lines have also been adopted by the Hartford Electric Light & Power Company, the Snoqualmie Falls Power Company, the Blue Lakes Power Company and others. All of these lines are many miles in length, that of the Blue Lakes Company extending a distance of thirty-six miles.

After referring to these facts, Mr. John B. C. Kershaw, in a paper read before the Institution of Electrical Engineers on January 11, states that, although many miles of bare aluminum conductors have been strung, no systematic efforts have apparently been made to ascertain the effects upon them of exposure to the weather. The author says:

"The old idea that aluminum was absolutely proof against attack by all agents excepting alkalis and hydrochloric acid is now known to be incorrect; and Ditte in communications made to the Academie des Sciences has shown that aluminum is easily attacked and corroded by air and water under certain conditions. It is therefore of considerable importance to inquire whether these conditions are present when aluminum is used as a bare conductor for overhead lines and is exposed to all the varieties of weather that we experience in the course of the four seasons of the year. In America electrical engineers are conducting this inquiry in the usual American fashion, and their installations of aluminum for transmission lines in California and other places are in reality large scale experiments which, if unsuccessful, will cause heavy losses to fall upon those who have been financing these undertakings."

Mr. Kershaw then goes on to state that with a view to solving this important question he has carried on two sets of experiments in the North of England since the fall of 1899. The samples of aluminum used were in rod and

wire form, cut into two-foot lengths. These were mounted upon glass insulators in two frames, on which were also mounted samples of copper wire and galvanized iron wire. These frames were then exposed to the weather for ten months without being moved—the wires on them however first being carefully weighed and tested for conductivity and tensile strength.

On making a surface examination at the end of the period mentioned it was found that the aluminum wire was pitted on the under side where water drops had collected and dried. There was apparently no change in the galvanized iron wire while the copper wire was oxidized on the surface, but was not pitted. The aluminum samples, it was discovered on placing them on a balance, had gained in weight from nil up to .83 per cent. on the original wire after being thoroughly scrubbed. It was also ascertained that there was a considerable loss in conductivity and tensile strength, due to the exposure and pitting. The galvanized iron samples had also lost in weight, while the copper wire showed no change whatsoever.

The author concludes that the results obtained cannot be looked upon as final in view of the fact that the atmosphere and elements that go to make it up differ in different localities, and he wisely suggests that experiments be carried on in a number of cities at the same time. In his opinion, however, where a town burns a large amount of coal the atmosphere will be impregnated with impurities that cannot help but affect aluminum conductors. Commenting on this fact he states that "under such conditions all metals used for overhead conductors are subject to attack, and aluminum is unsuitable for use, owing to the pitting which occurs. In such towns it is advisable to use copper for all overhead wires, and the proposal to use aluminum, especially for overhead trolley lines, must be condemned."

"In country districts or in small towns, where the impurities in the air are reduced to a minimum, all metals experimented with seem to be fairly durable, but the slight pitting of aluminum which occurs—even in such an atmosphere—may prove serious: for by allowing the lodgment of small particles of foreign matter it may in time lead to the disintegration of the whole mass of metal."

The results obtained and the conclusions arrived at by Mr. Kershaw are well worthy of attention, and the experiments carried out by him might with advantage be duplicated in

this country now that so many thousands of dollars are being invested in aluminum conductors.

* * *

Compressed Air Cars.

Considerable matter has appeared from time to time in these columns on the subject of compressed air cars for street railway service. Inventors have been at work on this subject for years, yet it is only comparatively recently that a type of motor has been brought out that gave any kind of satisfaction. As is generally known the Metropolitan Street Railway Company, with a view of obviating the necessity of building a conduit system which meant the expenditure of a very large sum of money, has for some time been experimenting with compressed air cars on its Twenty-eighth and Twenty-ninth street cross-town line. In a recent issue of our contemporary "Compressed Air" there appears a very interesting article on this subject, including a table giving the number of cars operated, cost of repairs, cost of operating and many other things of importance.

Our contemporary—as in duty bound—naturally considers compressed air cars the solution of the problem of street railway transportation, and points out among other things that although the expense of operating a compressed air car comes to 17.42 cents per car mile, this figure could be considerably reduced were more cars in operation, as the capacity of the compressor at the charging station is much greater than is necessary for the number of cars now in use.

The cost of operating horse cars in this city is 18.98 cents per car mile, the cost of drawing cable cars 17.76 cents, and the figures given for electrically propelled cars are 13.16 cents. From this it will be seen that it now costs almost as much to run a compressed air car a mile as it does a cable car, yet the cable has been or is being done away with all over the city on account of this very expense of operating. Our contemporary thinks that when "the conditions are all correctly adapted to the work" the cost of operating a compressed air car per mile can be reduced to 13.57 cents, which even then would be slightly more than the cost of operating an electric car. But this reduction in cost is as yet only surmise, and the fact remains that compressed air cars entail an expense of 4.26 cents more per car mile than electric cars, which saving in a year on the total number of car miles on the Twenty-eighth and Twenty-ninth street line would be sufficient to pay 5 per cent. interest on a sum that would permit of the building of an electric conduit road. And that is what the New York traveling public requires, as the compressed air cars puff, snort and wobble like locomotives, to say nothing of the long trail of grease and dirt which they leave in their wake.

* * *

Coal Dust as Fuel for Steam Boilers.

Experiments looking to the utilization of coal dust as fuel have been made from time to time with encouraging results. In a recent issue of a foreign publication some tests made in Switzerland are described which are quite interesting. The first experiments made in that country on the use of coal dust as fuel for steam boilers were carried out in 1896 by Mr. Gressly, at the Berne Small Arms Factory, under the superintendence of the Swiss Society of Boiler-owners. The boiler used was that of the Sul-

zer-Cornish form, and the Mehl grate and Wegener system of firing were both tried. The results appeared in the 1896 report of the society, and showed that the dust could be burnt smokelessly with a thermal efficiency of 20.93 per cent., and a saving in cost of steam of 15.5 per cent. Subsequently, at the Gelafingen Iron Works, a Lancashire type of boiler was fitted up for coal-dust burning, and since the spring of 1897 Messrs. Sulzer have given the subject great attention. In Basle the Warteck Brewery took up the subject, and used the Wegener apparatus and comparative tests were made with this and the Cario system of firing, and proved favorable to the former. At the Polytechnic, at Zurich, the Wegener system was used for a time in an old boiler, but was given up, as it was feared the excessive heat produced would injure the furnaces. The author points out that the boilers require to be specially adapted for dust burning. For successful results the dust may be in the form of very fine powder. A table is given in the original of the results obtained at the cement works at Ehingen as compared with firing in a Ten-Brink furnace, and the costs of the former appear very favorable, as the dust firing enabled a very cheap kind of coal to be used. It appears, however, that the coal-dust firing has been subsequently given up, not, however, owing to inherent defects in the system, but because the excessive heat produced by the dust was localized so much that it caused damage to the furnaces of the Ten-Brink boilers, which had not been specially designed for the use of dust, but merely temporarily altered for the purpose. The author considers that the process is well worth attention, with the special kinds of coal which produce a great deal of slack.

That such is the case there is not the slightest doubt, for there are thousands of horse power of electrical energy stored in coal dust heaps throughout the country that in the past have not been considered worth the carting.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

PROF. LUCIEN V. BLAKE, head of the electrical department of the University of Kansas, has been experimenting for some time on an electrical process by which precious metals may be obtained from ore cheaper than by any process now in use. The details of the invention are not given, but it is stated that the method has proven satisfactory in an experimental way and will shortly be given a trial on a practical scale by a prominent smelting concern.

DR. A. E. KENNELLY will lecture on solar eclipses before the Franklin Institute, Philadelphia, on Friday evening.

A FRENCH electrician has just brought out a system of wireless telephony which is said to have been tried successfully at Saint Germain over a distance of 1,000 meters. The details of the invention are not given.

PROVISION has been made by the Appropriations Committee of the House of Representatives in Washington for the purchase and installation of searchlights at strategic points on the shores of New York Harbor, as a part of the system of defence. An appropriation of

\$150,000 for this purpose is included in the Fortifications bill reported by the committee recently. These lights, according to army engineers, will be placed at Fort Hamilton and other points, and will enable the operators to flood with light the new channel now being dredged in case an enemy should attempt to enter.

A REPORT from Pretoria, South Africa, states that eighty Boers raided Brak Pan one morning last week. They put a guard over the employees of the electric power works while they damaged the dynamo and other machinery. The works belong to a German company and supply the suburbs of Johannesburg and the mines with light and power.

THE Central Cable Office announces that the Great Northern Company and the Eastern Extension Company have constructed land lines between Pekin, Tientsin and Taku in connection with the neutral cables established last year between Taku, Chefoo and Shanghai. The stations at Pekin and Tientsin were opened last week.

A FRENCH military engineer by the name of Lanette suggests reaching the North Pole by means of an ice tunnel which would be lighted throughout by electricity.

MR. F. A. WUNDER, who has been connected with the Siemens & Halske Electric Company of America, will open an office on February 1 at 95-97 Liberty street, New York, as general sales agent of the Ball Electric Company of New York City.

THE basin of the fountains, which stretches in front of the Electric Tower at the Pan-American Exposition at Buffalo, is already imposing in its appearance, although it is by no means finished. Here in this basin, as on the tower, advantage will again be taken of the enormous amount of electrical energy which is at the command of the managers and designers of the Exposition. Moving electrical pictures will be thrown upon the surface of the lake as they will be thrown upon the facade of the tower. The plan for the basin is a series of combats between red imps and vari-colored goblins. Their struggles will be furious, but the imps will win, and slowly drown the goblins. This will be accomplished by an entirely new electric device. These plans, so wonderful in themselves, are being constantly augmented day by day. The fact of an unlimited and comparatively inexpensive supply of electricity has bent the energies of many inventors toward devising new features of this kind of display.

In a report to the State Department at Washington on the competition of electric vehicles in Berlin, Consul Hughes, at Coburg, says that the battery taking the first honors weighed only 121 pounds a kilowatt hour, while the heaviest weighed 286 pounds a kilowatt hour. The average weight of the 13 vehicles participating in the competition was 165 pounds. The smallest consumption of energy a ton mile at the mean speed amounted to 91 watt hours for a passenger car, a performance which surpassed all previous records. However in nearly all the cases the demand did not vary greatly with the speed, which leads to the conclusion that the electrically propelled vehicle should be driven at the highest speed consistent with public safety in order to ob-

tain the greatest commercial economy of energy. With regard to the motor best adapted for the weight to be propelled the capacity should amount approximately to one kilowatt to each ton of the rolling weight.

A new electrical machine has been invented by which, it is claimed, ice can be made in houses or apartments at much less cost than it can be furnished by any company. The machine is operated by a one-horse-power motor, which is declared to be capable of producing 1,200 pounds of ice in twenty-four hours, at a cost to the consumer of about \$1. It is also declared by the electric company which is using the machine that a small refrigerating machine on the same principle can be installed in any refrigerator which will maintain an absolutely even temperature for a whole season, and that it will also produce small pieces of ice for an ice-pitcher, and may be used for freezing cream. In Hartford, Conn., the electric light company intends to lease the machines to householders, and charge them only for the current used in them. The new machine uses anhydrous ammonia, and its expansion is regulated by a small electric motor, which goes about its work automatically, and requires no more attention than the usual oiling.

DOUBTLESS everyone who has ridden on any of the under-running trolley cars in New York City has noticed the uncomfortable jerk and jar which usually occurs when the motorman starts the car. This annoyance is frequently as great and often greater than that caused by the sudden starting of a cable car. So many complaints have been heard from the traveling public regarding this matter, that electric railway engineers are devoting considerable attention to it. The principal cause of the sudden jar on starting a trolley car lies in the fact that the controller through which the current passes from the contact rail to the motors is not supplied with a sufficient number of graduations, so that current may be more gently applied to the motors. It is a very simple matter to design and manufacture a proper controller, but the chief difficulty in the way of its adoption by electric railway companies is its very much increased cost over the type now in use.

THE question of fatigue caused to the eyes by various kinds of artificial lights has recently been taken up and studied at some length by a Russian Government expert. He says that the involuntary closing of the eye—winking—is a sign of weariness. Using surfaces illuminated by various lights he counted the involuntary movements of the eyelid, his results being that when candlelight was used the eyes were closed 6.8 times a minute; with gaslight, winking occurred 2.8 times a minute; with sunlight, the eyes closed 2.2 times, and with electric light 1.8 times. From these facts he draws the conclusion, which seems to be corroborated by other observations, that the electric light is the least injurious to the eyesight of all varieties of artificial illuminants. Whether his relative figures of eye fatigue are of value or not, they are, at least, interesting and probably represent a fair approximation to the facts.

THE officers of museums have to take extraordinary precautions to protect the treasures committed to their care. Canes and umbrellas, as is well known, are taken away from the

visitors at the doors. In one museum of national reputation there is a large staff of attendants constantly patrolling through the different rooms, and even at night watchmen are regularly making their rounds, as much to watch for possible burglars as to give the alarm in case of fire. Beyond this there is a burglar-alarm system elaborated so as to protect all the rooms and the cases in each room. In one room the Greek ornaments of gold are estimated to be worth \$500,000. This is naturally a great temptation to crooks, who are well aware of the location of the room and the value of its contents. But any thief who undertook to ply his calling in this particular room would run a very good chance of rueing his enterprise. There is only one entrance to the room, which is guarded constantly by two men. But what makes the room absolutely thief-proof is its electrical equipment. The room is literally threaded throughout with electric wires. Under each article in the cases, even though it be only a small ring, there is a tiny wire, invisible to the casual observer—and the presence of which would never be suspected by the uninitiated. This wire connects with the office of the director of the museum, several rooms distant. If an article is touched or disturbed the alarm immediately rings in his office, and the door of the room is at once closed. So that if the thief happened to be within he would be safely caught in a trap.

JUDGE HENRY, of the Circuit Court at Kansas City, has handed down a case of national importance, when he, in a written opinion, decided that the State of Missouri, represented by the State Board of Equalization, had no right to tax the franchise of the Western Union Telegraph Company.

How metals gather into the veins in which miners find them is not well understood in some cases, but electricians are now proposing to use electricity to do the work of concentrating. In some copper mines, for example, the richer bodies of ore have been taken out and the remaining copper is scattered in small particles through the rock. The rock is too "poor" to work at a profit in the ordinary way. But by flooding the mine with water, adding acid, if necessary, inserting widely separated electrodes and turning on the current of a powerful dynamo, it is possible, it is thought, to cause the copper scattered through lean rock to gather where it can be gotten at. Copper will be deposited on the electrode in proportion to the amount of electrical energy supplied. After a year or two the mine may be pumped out so that the electrode may be reached and its deposit of metal may be extracted. Lean deposits, especially if in the neighborhood of water powers, may be thus worked to great advantage, since the resulting metallic deposits will be pure and will require no further treatment.

At a recent meeting of the Vienna Society of Physicians, Dr. Schiff and Dr. Freund reported an interesting action of high-tension currents on the skin, which appears in the "Lancet." According to the authors, when the hairy skin is exposed for twenty minutes to the silent discharge of the negative pole of a powerful Ruhmkorff coil, such as is used for the production of the Roentgen rays, the hairs commence to fall out, the hair-bulbs become

atrophied after the third exposure, and some days later the portion of the skin which had been exposed becomes perfectly bald. The hair follicles become red and inflamed after the first two exposures. These observations seem to prove that depilation can be produced by the action of high-tension currents, and that the depilatory effect of exposure to the Roentgen rays may be accounted for in this way.

ACCORDING to "L'Industrie Electrique," Paris, a scheme for electrical transmission on a large scale is suggested in connection with the town of Roanne, in France. It is proposed to obtain the necessary power from the River Loire by the construction of a canal parallel to the course of the river, over a distance of about 7½ miles. The fall in this section of the river is so great, that by the construction of the canal an available head of 135 feet would be obtained even when the river was low. It is estimated that sufficient water could be taken from the river to generate 100,000 hp.

THE continued preference of engineers and users for direct-coupled generating sets has practically driven the manufacturers of leather and rubber belting from the electrical field. In fact, the question of a thorough understanding between the builders of steam engines which are to be direct-coupled to generators and the manufacturers of the generator has come to be of such importance that it formed the subject of an address recently delivered by H. C. Ebert before the Engine Builders' Association of the United States. The author of the address discussed the question at great length from the standpoint that the engine and generator specifications must be analogous in so far as capacity, speed and regulation are concerned. He also argued that there should be uniformity in rating engines in regard to the overload capacity of the generator to be driven by it.

A MECHANICAL expert of Hamilton, O., has invented an electrical process for developing steam in boilers. By the device water is projected in the form of a dense spray on electrically heated flues, thus generating steam instantly. The electricity is provided by a dynamo, which is in turn to be operated by the excess steam of the boiler. The only power required outside this compensating process is the initial force needed to start the dynamo and run it long enough to get up steam. This will be furnished by a small gasoline engine and a pint of fuel. A company has lately been organized to develop the invention. It is composed entirely of practical mechanical men and they are all confident of success.

A RECENT cable dispatch from London states that it was generally believed that an American firm would secure the contract for equipping the old underground system of London with electric traction. The American bidders were the lowest except Ganz & Company of Budapest. The bid of this company was not only much below that of all others, but it proposes an entirely new system, for which it claims great novelty. The directors deferred the awarding of the contract. They will send a committee of experts to Budapest to investigate. Particulars of the proposed system are not yet obtainable.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 12.

A TALK TO WIREMEN.

To be a wireman is to be in possession of a trade that is equally as hard to acquire, is just as intricate and takes as long to master as any trade we might mention, in fact we can think of no trade that requires the constant application of the workman to it, to keep himself up-to-date and on a par with the continually improving apparatus and systems, as that of the wireman; yet how abused the term is. How often have we seen a man pose as a wireman who has probably been employed for a few months only at the line of work, and then it may be at only one particular branch, such as the installation of a system in a large building. He is also just as liable to use the term electrician in designating his profession.

The electrical industry has at this age assumed such proportions and covers such a vast area of the industrial world that it is practically impossible for a man to master all the branches or even very many of them, and we find the most proficient tradesmen to be those who have directed their attention to a particular branch. We also find the most successful men employed in the electrical industry to be those who have applied their attention and labors to mastering the art of one particular line; however all the branches may and do have considerable that is common, and that constitutes a general knowledge of the electrical science, its laws and governing influences.

The wiremen comprise a large majority of the men employed in electrical work to-day, and to them I will particularly direct this article and endeavor to give an outline of what a man must familiarize himself with and master before he can unhesitatingly go before the world saying he is a wireman, and at the same time place before the trade's fraternity a standard for this branch of the electrical industry.

There is nothing that will keep down the price paid for a certain branch of industry like a low standard of efficiency recognized by that branch as constituting a tradesman.

The term electrician applied to a wireman is wrong although it may be a higher sounding title. A wireman is no more an electrician than a carpenter is an architect. Because a carpenter can construct a picket fence in front of your house is no indication that he is an architect, and because a wireman can design, wire for and install an electric bell does not assert that he is an electrician; but because a carpenter is not an architect does not make him any the less valuable as a carpenter, or because a wireman is not an electrician does not deteriorate his value as a wireman. The two are separate and distinct classifications.

Generally speaking there is no tradesman who is placed as much on his own responsibility as a wireman or who is continually being placed in positions where he must rely entirely upon his own good judgment. So also there are probably no other trades that admit of the

same opportunity for slighting the work without fear of detection. If a workman does open work, then an examination will demonstrate his ability, but in concealed or conduit work a great deal of dependence must necessarily be placed on the wireman.

Quite recently I had a conversation with an official of the inspection bureau of the Fire Underwriters' Association of one of our large cities and he informed me that there are more poor wiremen caused by incompetent and unreliable companies and are a direct result of competition in prices that are caused by the individual negligence of the men. He further stated that often when he had occasion to draw a wireman's attention to unworkmanlike work he would be answered to the effect that it was a "slide" job, which probably meant that the unreliable contracting company had taken the contract at a very low figure to outbid their competitors. In a case like this the company is irresponsible and the workman soon becomes the same if not cautious.

A few days ago I talked with a prominent engineer, a gentleman who has probably supervised the wiring and installation of electrical plants in as many large buildings as any other engineer in this country, and I told him I was going to talk to wiremen through the columns of *ELECTRICITY* and would like to quote his opinion on the wireman of to-day, and he said: "Say, Eaton, tell them there was never the demand for good wiremen that there is to-day, and if they do not get as high a rate of wages generally as other trades it is because they have no standard for a tradesman. When I come across a thorough wireman I have to pay the price to get him and he is not out looking for employment either."

A wireman must naturally be a mechanic, he must be in possession of good mechanical ideas and be familiar with, in a general way, all building trades. It is essential that he understand the general construction of buildings. For example, if we send two men to do similar work on a building and electrically they are of equal ability but one understands the general construction of buildings and the other does not, you will readily see the difference in the quality of their work. The former will be able to take advantage of so many facilities known to him, that the two pieces of work when completed will have no semblance of similarity.

A wireman must understand Ohm's Law and its application, also have a detailed knowledge of all standard systems of wiring, not only for light and power but also for bells, gas lighting, telephones, etc. He must be familiar with modern circuits and systems of circuits, and also his electrical knowledge must be sufficient to permit him to understand or devise circuits to accomplish desired results.

He should understand the theory and application of all safety devices used in wiring.

He should be able to calculate sizes of wire for distribution, loss and safe carrying capacity, also be able to say what kind of insulation is preferable to use under certain conditions, as for instance in dye houses or chemical laboratories.

He should be able to work from architects' drawings, and be familiar with all signs and terms used by them in these drawings.

Above all things wiremen should be thoroughly familiar with The National Code of Fire Underwriters' Rules. I might state here that it is practically impossible to make a set

of rules that will hold good in and govern all cases. The National Code of Fire Underwriters' Rules do not, but the wireman should be intelligent enough to understand the object governing the rule, and if the conditions do not permit of obeying it his electrical ability should come to his aid in devising a means of accomplishing the result with an equal amount of protection.

Of course in connection with all this it is understood that the wireman has the ability to execute his work in a workmanlike manner, for without this even if he was well versed in all the other points technically he would by no means become a successful workman and command a price for his labor.

Now, to the reader who aspires to becoming a wireman, permit me to say that he individually will create his own value as a tradesman and that value will depend entirely upon his proficiency in the art. Do not be misled by the idea that you are a wireman just because you may be able to put up a piece of moulding work or install a few electric lights. Do not let your ambition rest until you have mastered the art in all its detail, and when you have done this you will have placed upon your labor a value that will make you independent of influence or combinations to secure for you a position and a just and satisfactory compensation for your labor.

Article No. 13 will be entitled "The Three Wire System."

THE TRADE EDUCATION OF CENTRAL STATION EMPLOYEES.*

GENERAL.

The investigations of this committee have shown them that they have a big subject to deal with, and one which is rapidly changing in aspect. This report may be therefore characterized as preliminary, and it is our belief that the committee may be advantageously continued for the purpose of further investigations into the working of correspondence schools of various types with a view to making a more complete comparison of the results obtained by these schools.

For the present the committee has felt that it is desirable to divide the subject and discuss it under three heads:

1. Can correspondence instruction be relied upon to increase the usefulness of electric central station employees to their employers?
2. Are existing courses of the correspondence schools properly adapted to be of the greatest use to electric central station employees and through them to their employers?
3. What provisions may central station owners reasonably supply for the purpose of encouraging their employees to study the requirements of their business and how may those provisions be executed?

Your committee finds that for the purpose of this report only four correspondence schools need be considered, since these are the only ones which present courses for electric central stations at large. These four schools are given in alphabetical order as follows:

The American School of Correspondence, Boston, Mass.

The Electrical Engineer Institute of Correspondence Instruction, New York City.

* Abstract of a report of the Committee of the Northwestern Electrical Association, appointed to consider the advisability of central station managements encouraging their employees to enroll themselves in courses of correspondence schools.

The International Correspondence Schools, Scranton, Pa.

The United Correspondence Schools, New York City.

Each of these schools has an enrollment in all of its courses which aggregates thousands.

One school, the International, advertises an aggregate total enrollment of 200,000, or thereabouts. This aggregate, however, must be understood as representing the total enrollments which the school has enjoyed since its organization, but even thus considered the number is big enough to be amazing. The enrollments of the other schools are smaller than this, but they are in each case large enough to provoke consideration for their work.

The United Correspondence Schools, which is incorporated in New York, has a capital stock of \$250,000. An inspection of the headquarters of this school also makes it evident that a considerable sum is invested in fixed equipment, or is required in handling the business of the school.

The American School of Correspondence is incorporated under the laws of the State of Massachusetts, and the Electrical Engineer Institute of Correspondence Instruction is incorporated under the laws of the State of New York. Neither of the latter two institutions advertises its capital stock, but it appears from an inspection made by your committee that the money invested in these schools is not so extensive as that invested in the others. This must not be understood to be necessarily an unfavorable criticism. Your committee is not prepared to say that the moneys invested in the buildings or equipment in the other schools are essential to the best success of their efforts to teach, though they must be contributory thereto.

In the effort to get information with respect to the correspondence schools, your committee was dependent to a considerable extent upon the schools themselves. The chairman of your committee expended considerable time and some money in interviewing the managers at headquarters of the several schools and making personal examinations of the arrangements for dispatching business. An unfortunate conflict of engagements made it impossible for him to interview the manager of the International Correspondence Schools at Scranton, but he has had correspondence with him and his Western superintendent, and has interviewed the principal of one of the important departments of the school, and also the Western superintendent of the school.

All the schools have courteously responded to requests for information and all of them, with one exception, have given fairly complete information upon points inquired about—two schools have in fact offered more than the committee specifically asked for. The exception is the Electrical Engineer Institute of Correspondence Instruction, which courteously declined to lay bare its methods of business management and the results attained by its school. This refusal was made notwithstanding the fact that the committee only desired and requested the information needed for the purpose of arriving at a just conclusion with respect to the merits of the school.

The United Schools gave full information, but were unwilling to allow correspondence to be carried on with their scholars except through the home office.

FIRST HEAD.

1. Can Correspondence Instruction be Relied

Upon to Increase the Usefulness of Electrical Central Station Employes to Their Employers?

For the purpose of aiding the committee in making its judgment upon this matter we sent out letters to from fifty to seventy-five of the scholars of each of three correspondence schools.

These letters were accompanied by a list of questions which read as follows:

QUESTIONS.

1. What is your employment?
2. What regular schooling have you had?
3. How long have you been enrolled as a scholar in the correspondence school?
4. What course are you taking, and how far along in your course are you now?
5. How much practical advantage have you thus far found from your correspondence school lessons?
6. How far do you feel that you can ultimately increase your value to your employer by taking the instruction in the correspondence school?
7. Do you now intend to complete the full course you have entered upon?
8. How long do you think it will require you to do this?
9. Would it have been impracticable for you to have taken a full course in a manual training school or a high school?
10. Do you anticipate ever preparing to enter a regular engineering course in a college?

One of the schools (the American School of Correspondence) courteously furnished us with a list of about seventy-five of its scholars to whom letters were sent and from whom replies were received—each of the replies being more or less full. Two of the schools (the International and the United Correspondence Schools) preferred to send out the letters for us rather than to give the names and addresses of their scholars, which might perhaps be a violation of the confidential agreement with their scholars. The answers to these letters were then forwarded to the chairman of the committee. One school (the Electrical Engineer Institute of Correspondence Instruction) refused to either furnish a list of names of its scholars or to send out letters of inquiry furnished by the committee for the purpose.

The chairman of your committee received approximately 250 replies from the scholars of the three schools named above. The answers were enthusiastically affirmative regarding the advantages derived from the courses of the schools. This was true to a unit. As the schools each had the opportunity to pick some 50 to 100 scholars, to which the letters were sent, from perhaps some thousands or even tens of thousands, we may very properly credit them with furnishing the addresses or forwarding our request letters to scholars who were recognized as being satisfied. Notwithstanding this advantage on the side of the schools, your committee was surprised at the extreme unanimity with which the courses of the schools are approved by the scholars.

The subject of this division of this report is dealt with from the scholars' point of view in their answers to the fifth and sixth questions. Some thoroughly concrete information might perhaps have been obtained through correspondence with the employers of these various scholars, but your committee did not feel privileged to undertake this without first invoking the permission of the schools and then individually requesting permission from the schol-

ars themselves, since there appears to be some sensitiveness in respect to making known the names of individuals who are enrolled in correspondence school courses.

A properly planned correspondence course may put the fireman upon a proper footing with respect to his handling of the coal. The engine runner, the dynamo tender and the wiper may all likewise be made more efficient through a proper understanding of their business, with a considerable increase resulting in the net earnings of a station. It is particularly important that the chief operating engineer of a station and the superintendent of the company shall be well trained in matters relating to the economical combustion of fuel for the raising of steam, the economical operation of steam engines and auxiliaries, as well as the economical handling of electric machinery and devices, and that they shall be competent to properly instruct all of the station employes.

The central station company, whose superintendent and chief operating engineer are not acquainted with methods of analyzing flue gases, testing the quality of steam, the use of the indicator for the purpose of checking the valve setting of the engines, and various other special tests about the station, loses through the chimney, through radiation, defective engine-running, and other defects, large sums of money every year. Sums which are lost by many stations on account of the defective knowledge of the employes would, in fact, if saved, be sufficient to pay for the entire cost of correspondence courses for the more important men in the station and still leave a handsome margin over.

That advantages may be gained through a proper training of the employes is shown through the experience of many central stations, and it is also illustrated by the answers which your committee has received to its various letters of inquiry from the employes themselves. We may set it down as a fact that the average central station may in large measure improve its economy as the result of the proper trade education of its employes.

SECOND HEAD.

2. Are Existing Courses of the Correspondence Schools Properly Adapted to be of the Greatest Use to Electric Central Station Employes and through them to their Employers?

Each of the four schools referred to in the earlier part of this report describes one or more courses which are apparently intended for the training of electrical artisans. These courses are called by various names, and are held out by the schools as having value for central station employes. It is readily understood that the value of these courses to such employes must depend upon the subjects treated in them and upon the way in which those subjects are treated. The subjects treated in the various courses which the several schools claim are adapted to the needs of central station employes are set down in the advertising matter of the schools.

Your committee does not believe that any of these courses are adapted to give the greatest returns to central station employes and their employers. We hold the highest appreciation of general education and heartily believe in its great usefulness, but the need of the central station employe can only be met by a course that makes immediate contact with his daily work and continues in that contact through

every lesson sheet, while it teaches him to keep in continual view the best methods for executing his work. In other words, the need is for trade instruction, rather than for broad education. Such a course in its most elementary form might be readily completed by an industrious man of good caliber, who used his spare hours for study (say four to six hours per week), in eighteen months to two years. The existing courses of correspondence schools which are recommended to central station employes vary in length. Some are as short as need be desired, while others are several times as long. None of them contains the essential element of immediately useful and practical information.

The various schools frankly admit that they have prepared no course that fulfills the requirements held out by your committee, but they severally recommend from amongst their courses those just outlined, as most nearly touching the requirements. The time required for the industrious man to complete them by study in spare hours is estimated and set down below:

American School—"Electrical Engineering Course." Time, one and one-half to two years.

Electrical Engineer Institute—"Course No. 13" (in electric lighting and central station practice) or "Junior Course." Time, two and one-half to three years.

International Schools—"Electric Power and Lighting Course." Time, one and one-half to two years.

United Schools—"Complete Station Engineering Course." Time, two years.

ADMINISTRATION OF THEIR COURSES BY THE SEVERAL SCHOOLS.

The methods of administering the courses by the several schools do not essentially differ. The processes are more or less familiar to the members of this Association. Two of the schools employ active solicitors for enrolling scholars, and one of these has a remarkably complete organization. The other two schools claim to solicit solely by advertisements and correspondence, but they pay commission for enrollments brought to them.

There is also a market similarity between the methods of the several schools in treating the candidate after he is enrolled. Each supplies the scholar with printed "instruction papers" or lessons which are put out in pamphlet or book form, and expects him to study the lessons, inquire by letter when unable to surmount difficulties, and finally return answers to a set of "examination questions" on the subject matter of each lesson. Each "examination paper" returned from the scholar is carefully read by clerks at the principal office, is corrected and graded, and is then returned to the scholar with any pertinent comments. The process extends to the drawings as well as to written matter.

CHARACTER OF INSTRUCTION PAPERS.

The question of the character of instruction papers, whether in sheet, pamphlet or book form, of the several schools arises for consideration. To its consideration your committee has applied itself with great interest and diligence. Each of the schools supplied the committee with a set of its lessons covering an entire selected course, or with a partial set which is presumed to contain typical lessons. These instruction papers or lesson sheets are made up in fine form, and in the case of one school are supplied to the scholars as several large vol-

umes bound in half leather. The lessons are the foundation of the entire system of each school, and the importance of their place is testified to by the care that has evidently been given by the schools in perfecting them.

The lessons that have been supplied to the committee for its examination may be divided into three classes—

1. Instruction papers adapted to give an elementary but reasonably practical view of applied electricity to clerks and others who do not have an intimate knowledge of and contact with machinery.

2. Instruction papers adapted to instruct apprentices and artisans in the important features relating to their daily employment.

3. Instruction papers which are more advanced than the latter, being adapted to the grade of information which may be presumed to be possessed by superintendents, foremen, and others, and which verge upon professional engineering.

Your committee will discuss the lesson sheets of each of the schools on the basis of this classification.

The American School of Correspondence furnished to your committee a complete set of the instruction papers relating to the "Electrical Engineering Course," with the exception of six optional papers in mechanical drawing. This is the course which they recommend as adapted to central station employes. It includes twenty-nine separate pamphlets. The instruction papers appear to be accurate and reasonably well written. The course appears to your committee to belong to the first class, and to be more distinctively adapted to office clerks and others who do not get contact with the machinery, than to the instruction of firemen, dynamo tenders, floor engineers, linemen and others who are well acquainted with the general processes, but for whom it is desired to obtain instruction that will result in economies in station operation.

The Electrical Engineer Institute of Correspondence Instruction recommends either its "Junior Course" or its "Course 13." The lessons of each of these courses are contained in some forty or fifty pamphlets that are sent out to the individual scholars. These courses appear to your committee to belong to the third category. They appear to be accurate and logical and to be adapted for the instruction of superintendents, foremen and others who may be assumed to be men well informed in the general details of their business.

The volumes of the International Correspondence Schools which relate to the "Electrical Engineering Course" and its off-shoots seem to be admirably adapted to the comprehension of central station employes, and they are recommended by the school for the instruction of such employes. They belong essentially to the second category. The papers are well written and appear to be accurate.

The instruction papers relating to the electrical courses of the United Correspondence Schools appear to be intermediate between the first and second categories, but they are sufficiently inaccurate to be rendered valueless. This inaccuracy is particularly surprising, since the "Mining Engineering Course" of this school has been supervised by a number of eminent specialists, and your committee, therefore, hoped to find a thorough appreciation of accuracy in the work of the school. Your committee informed the presi-

dent of this school that the instruction papers contained inaccuracies, and was immediately assured by him that the school desired to make its instruction as perfect as possible and that it would make every effort to eliminate all errors.

[The balance of the report with discussion will appear in our next issue.—ED.]

CARE OF BOILERS.

Whatever plan is adopted for securing water to feed the boilers should not interfere with the general plan of feeding at the same rate that the steam is used, so that the water line will remain nearly in the same place at all times. In every plant where there are two or more boilers, it is sometimes necessary to lay off one of them for cleaning or repairs. In fact every plant should have an extra boiler to use in case of necessity, and this means whenever it is advisable to clean one of them, as the practice of running boilers almost continuously should be discountenanced on all convenient occasions. The plan of leaving boilers empty is a good one, provided steam and water are excluded from them. This opinion is based on experience in starting up a boiler that had not been used for fourteen years, for no internal corrosion was found in it, while the external parts were but slightly affected by its long rest. It was set in brick according to common practice, two walls of the building serving as a part of setting. After it had been thoroughly inspected it was run for several years under as much pressure as a new boiler of equal diameter is usually allowed without calling for repairs except tightening two braces, and probably this was needed before it was laid off. When boilers are to be left idle for a long time they should be thoroughly cleaned, as soot collects and holds moisture, so that corrosion goes on underneath the apparently harmless covering until the plates are ruined. A coat of good paint suitable for ironwork will assist greatly in preserving the boilers out of use, and as the expense of it is small, it does not pay to neglect it, for good second-hand boilers are frequently wanted by parties who do not care to invest in new ones for reasons of their own; but when corrosion is allowed to eat into the tubes and plates they will soon be fit for the scrap heap only, and are not especially valuable even there. One advantage of a power pump and a driven well in connection with a good heater is that all of the pumping must be done before the engine is shut down, which means that exhaust steam is passing through the heater, and no cold water can reach the boiler. An injector, says the "Boilermaker," is very convenient in such a plant, because it may be run to fill up the boiler after the engine is shut down.

Motor and Cycle Show in Paris.

The Grand Palais, one of the few prominent buildings of the Paris Exposition, and the structure in which the art exhibits, including the United States section, were located, was reopened on the 25th inst. with an automobile and cycle show. The vast glass-roofed edifice lends itself admirably to the purpose of an exhibition hall, to which it is now devoted. A large and fashionable assemblage attended the opening. Several American firms are represented among the exhibitors.

A PERPETUAL MOVEMENT CLOCK.

Translated for *ELECTRICITY* from "La Vie Scientifique,"
Paris, France.

The Paris Exposition contained a very curious exhibit in the form of a clock which attracted much attention from visitors. It was placed in a glass case to protect its delicate working parts from meddlers. It was self-moving and it ran two months during the Exposition without stopping and without having been wound up by any outside force surreptitiously. There was no reason why it should have stopped for it was a true form of perpetual movement—within the limits however of the wearing out of its mechanism.

Its inventor was enabled to obtain these results by very ingeniously combining a system of levers, or hinged residual magnetic arma-

There are two circles composed of levers which are placed on the two side faces of the rim of a large wheel. These two sets of levers form an angle of 45 degrees with each other and at their outer ends counterweights are attached to the longer arm of each lever. From the start we conclude that the counterweights on the side farthest from the center of the wheel would give a preponderating turning force to the wheel, causing it to turn with a circular movement.

The cut shows the wheel in motion. It makes 4 turns per minute and its movement is regulated by a centrifugal governor put in motion through an endless chain.

The framework of the apparatus is of magnetized steel and supports the axle of the wheel and it is surmounted by a roller which forms one of the magnetic poles.

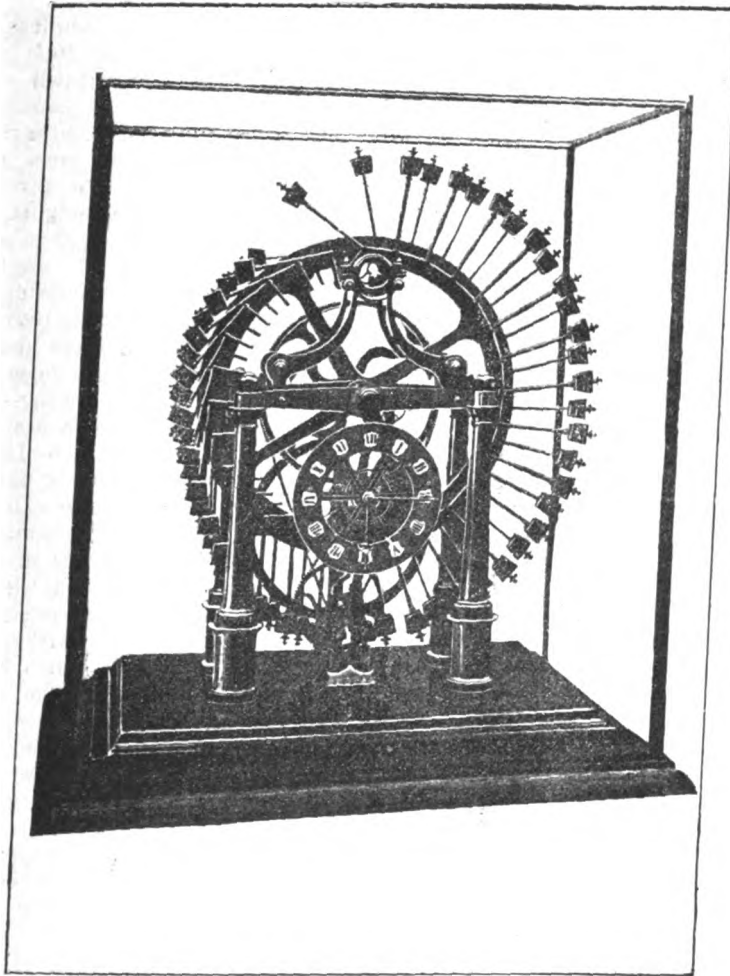
lever following, and without interruption for each of the 26 levers which make up each circle.

The motion of the wheel is transmitted to the clock spring through a pinion placed on the axle which meshes into a toothed wheel, which at its center has an endless screw acting on another smaller wheel, whose axial pinion rests on the wheel of the drum which winds up the spring.

This spring is rigidly held only by its central portion. The other extremity remains free and slides on the inner surface of its containing barrel. The purpose of this construction is to maintain a constant and equal tension in the spring, which the motor tends to increase in quite an irregular manner. By means of this construction the spring is kept wound up continuously and always with the same tension.

The inventor claims the apparatus to be only in an embryonic condition, and that it forms a new kind of a motor which may bring about a new era in clock-making particularly, and in mechanism in general.

To make this machine entirely automatic, it is only necessary at the start to magnetize to the saturation point once for all the tempered steel framework of the motor, whose consequent poles are used for acting on the various armatures.



LEON PALIS' PERPETUAL MOVEMENT CLOCK.

tures, which moved a wheel continuously around its axis for the purpose of winding up a spring, consequently the clock was only an accessory, for the apparatus could be used for other purposes and the construction of the wheel or moving mechanism alone contains the interesting features of the invention.

To explain this movement the inventor, M. Léon Palis, furnished the photograph from which our illustration is taken.

The basic principle of construction is the well known law in electrical physics that two magnetic poles of the same sign repel each other, while poles of opposite signs attract. In this case the magnetic effects are wholly repulsive and they could not be otherwise, for magnetic attractive force derived from permanent magnets is essentially a cohesive force which requires an equal separative force.

When the wheel in its movement brings the short arm of one of the levers, which may be called an armature, to the face of the pulley the phenomenon of magnetic repulsion takes place, which causes the long arm of the lever with the counterweight to rise to a vertical position, while the further motion of the wheel causes it to fall to the other side from the vertical position, and thus making it add its weight to each of the others which have preceded it to keep the wheel in motion.

We should notice here that from the moment the counterweight commences to raise, up to the time it attains a vertical position, its weight is null, because the repulsive magnetic force performs the same office that a jet of air or steam would, and maintains it in a state of equilibrium.

The same result takes place with the next

THE VICARINO SYSTEM OF TRAIN LIGHTING.*

Whether or not the problem of train lighting has been satisfactorily solved is perhaps an open question, but if the results claimed for the Vicarino system can be borne out in practice, it is certain that at least one other satisfactory system will have been added to those already tried.

There can be no doubt that, in principle, the electric light has many advantages over gas or oil. The questions of first cost and cost of maintenance, however, weigh more in the balance with railway directors than such incidental advantages as passengers' comfort, and this is not unreasonable since a railway company is formed for the purpose of transporting—*inter alia*—passengers from one point to another, and the contract ends when the passenger has been duly transported. A story is told of a director of a certain railway company who drummed for some minutes at the pigeon hole of a booking office before the clerk condescended to approach him and ask what he was waiting for. The director's reply was more forcible than polite, but when translated into parliamentary language ran somewhat to the effect that he was "waiting" to let the clerk know that he was a director of the line, and that the clerk would subsequently find out what that meant. "Good heavens," begged the clerk, "you must forgive me, sir, I thought you were only a passenger."

From the manner in which trains are usually lighted it may reasonably be inferred that the same principle obtains on most railways.

Assuming, however, that electricity is one of the best, if not the best way of lighting a train, it is clear that the system adopted should be based upon the following fundamental principles.

1. Apparatus employed should be simple and not liable to get out of order.
2. Weight should be as small as possible.

*From the "Electrical Review," London.

3. First cost of installation should be small.
4. Cost of production and maintenance should be at least as small as that of gas or oil.
5. Carriages should be capable of being run on other companies' lines.

Condition (5) is an important one, as the through traffic of a railway may reach a high percentage of its total traffic. This condition is manifestly complied with by an installation of accumulators on each carriage. Accumulator lighting, however, involves a charging station, and as it would not be easy to arrange for each carriage to carry a sufficient storage to enable it to return to its starting point before requiring a fresh charge, it would be necessary to erect charging stations along the line. This not only means expense, but delay, and this is a serious question on a railway.

Without entering into an inquiry as to the relative merits of the various system of lighting trains by electricity, which, moreover, are probably well-known to most of our readers, it may be well to consider shortly the salient features of the Vicarino system, which in its leading characteristics resembles the Stone system.

Mr. C. Vicarino uses an axle driven dynamo fitted with an ingenious arrangement of brush-holders, whereby the direction of motion of carriage is rendered immaterial. This dynamo supplies light to the carriage lamps in connection with a small battery of accumulators. An auxiliary apparatus cuts the accumulator in and out at the proper moment, and is also arranged to equalize the voltage so that the pressure at the lamps does not vary very much.

The dynamo, moreover, is compound wound, the series winding being arranged to oppose the effect produced by the shunt winding.

The general principle upon which the whole arrangement is intended to work is that at the normal speed of the train the dynamo is driving the lamps direct. At lower speeds the accumulator runs the lamps, and at higher speeds the surplus current generated by the dynamo over and above that necessary for the lamps, goes to charge the accumulator.

The following figures are given by the Compagnie Générale Electrique, of Nancy, as the results of tests made with the Vicarino apparatus, which, in this particular instance, was adjusted for a mean speed of 50 kilometers per hour. Obviously, it could be adjusted for any other speed.

COST OF PRODUCTION PER LAMP-HOUR OF 10 CP.	
	Centimes.
Renewal of lamps.....	0.1
(Cost of lamp assumed to be 80 centimes, and life 800 hours on the average.)	
Maintenance of positive plates.....	0.2
(The battery has a capacity of 40 ampere hours and contains 60 kilograms of positive plates at 1 franc 50 centimes per kilogram.)	
Acidulated water, oil, waste, etc.....	0.03
Motive power.....	0.25
(The power absorbed by each carriage is 0.5 hp., equal to 1 kilogram of coal per hour at 2 francs per 100 kilograms.)	
	0.58

Or say 0.6 centime per 10 cp. lamp-hour.

In comparison with this the company cite the following figures, which, it is stated, have

been gathered from the results of other systems of lighting:

	Centimes.
Oil per lamp-hour, 5 or 6 candles.....	4.5
Compressed oil-gas per lamp-hour, 10 candles.....	3.5
Accumulator lighting per lamp-hour, 10 candles.....	3.4
Acetylene per lamp-hour, 10 candles..	2.5

The first cost of installation for the various systems is given as follows:

Oil.....	about 200 fr. per carriage.
Gas.....	800 fr. " "

(Without regard to proportion per carriage of cost of erection of gas plant at station.)

Accumulators (8 lamps of 10 cp. and battery of capacity of 120 ampere-hours)..... 950 fr. per carriage.

Vicarino system (8 lamps of 10 cp. and battery of 40 ampere-hours capacity)..... 1,250 fr. " "

The cost per annum of the various systems, assuming the carriage to be lighted on the average 4 hours per day, is stated to be as follows:

Oil (4 lamps of 5 cp. = 20 cp.).....	262 fr. 80 c.
Gas (4 lamps of 10 cp. = 40 cp.).....	204 fr. 40 c.
Accumulators (8 lamps of 10 cp. = 80 cp.).....	292 fr. ..
Vicarino (8 lamps of 10 cp. = 80 cp. 70 fr. ..	

The company further draw attention to the applicability of their Vicarino dynamo for the generation of electrical energy from a variable source of power such as a windmill, or turbines driven by streams, the volume of water in which depends upon the rainfall.

NATURAL HISTORY IN MECHANICS.

"And now my young friend," said the professor of applied natural history, as he wiped off four or five square inches of one of his great spectacle lenses, "we come to a new and most interesting branch of the study of natural history—its application to the broad domain of practical constructive mechanics.

"I purpose showing you to-day, in part, how the various members of the animal kingdom contribute their share, often important, always interesting and useful, in the economy of practical science; and how, in their humble way, they have been developed—sometimes through long centuries, sometimes by rapid steps—to a condition which permits of their application as active or passive assistants to the mechanism or the constructor.

"We will first consider the vertebrates as our nearest relations in the animal kingdom, and see what useful part they play. The noble horse, once the swift courser of the desert, has been, after successive stages of ordinary slow burden-bearing, evolved into a stationary support for heavy masses, such as boilers and the like. His half-brother, the once much despised mule (of whom it has been contemptuously said that he has no pride of ancestry and no hope of posterity), has he not developed, under favorable circumstances and in proper surroundings, a degree of intelligence and dexterity which permits him to perform, unaided and in greater perfection, the textile tasks of many skilled spinning women? The once combative ram, first in the zodiacal procession—he of the hard head and great power of propulsion—now patiently drives huge piles for our great

wharves, or, snuffing the scent of battle, places himself at the prow of our mammoth warships and crushes the stout sides of the opposing vessels. The faithful dog, too—man's best friend among the quadrupeds—does he not serve to hold in his teeth irregular metal articles which are to be turned in the lathe? And the pig—of his fat body do we not mould great machines? The bull, which is an entity, confines his usefulness principally to furnishing meat for our table and leather for our footgear, lends us his great eyes, through which we reeve ropes. The agile and prehensile monkey has forsaken the forest glades and the lianas of his native land and entered our service as general handy man to wrench off tight nuts, set up bolts, drive nails, and be of use generally.

"Do we consider the volatile division of the animal kingdom—here we find the crane standing patiently on wharves or at railway sidings and lifting for us great burdens, while moving them at our command from place to place. The chivalrous and versatile cock, forsaking his dunghill, not only controls the flow of water and other fluids, but serves to discharge for us our guns. The crow, no less willing than his cousin, the crane, although in lesser degree powerful, raises weights at our bidding, while the gentle cooling dove lends her tail to bind box corners firmly together. And the bat—he of mixed relationship and nocturnal propensities—his humble body serves as building material for our shops and chimneys. The awkward and long-lived goose—she who once saved Rome by her cackling—contributes her awkward neck to the hydraulician while the machinist employs it as well as a tool for turning down materials in the lathe.

"As we descend in the scale we discover that the lurking alligator, now tamed in the service of his fellow-vertebrate man, grips gas pipe like grim death. And the 'slow but sure' turtle has become the indispensable assistant of the daily newspaper, in carrying upon his broad back the characters which the lightning perfecting press gives to the wide world to inform each of its inhabitants of the comings and goings and doing of all the others.

"When we consider the other cold-blooded inhabitants of the watery kingdom, we find the fish binding together the ends of the rails on our great steel highways; while the herring bone is adopted as the best construction for toothed gearings, showing how Nature anticipated proud man.

"We can scarcely investigate a group of the animal creation that we do not find its members humbly serving us in some useful mechanical capacity. The grasshopper once lent his huge, awkward, jointed limbs to the construction of locomotives; the obstinate and persevering beetle still drives wedges for us into the hardest oak, while the butterfly—although ever maligned by the poets as the fittest type of frivolousness and irresponsibility and uselessness—has long served to control the flow of gases, and even of steam in their proper channels. The fly delivers the printed sheets from the press as fast as they are ready, while her mortal enemy, the spider, serves as an integral part of the engine that drives the machines. And even the despised, down-trodden worm—emblem of insignificance and humility—exerts her poor power in driving gearing, so that from the highest down to the lowest rank, the animal kingdom is serving us daily, unheeded and unthanked."—"Carpenter and Builder."

PARIS LETTER.

Special Correspondence of *ELECTRICITY*.**Distribution of Electric Energy in Paris.**

The city of Paris, as we know, is divided into sectors, each of them being supplied with electric power from a central station. The different companies operating in these sectors have a franchise for eighteen years and they are subject to all sorts of charges. It is therefore very interesting to know what results have been obtained under these unfavorable conditions.

As an example we take one of the most important sectors, that of the Place Clichy. The annual report for this sector has just been published and from it we take the following figures:

The original 3,000,000 francs capital has been successively increased until it is now 13,000,000 francs, which actually represents the cost of the plant and the entire system with all its apparatus, switches, etc., showing an average investment of 58 francs per lamp. Since 1891, i. e., one year after the installation, the employees received a share of the profits, which share, in 1898 and 1899, amounted to 15 per cent.

On June 30, 1900, the total power system was 8,300 kilowatts, represented by 276,651 incandescent lamps of 10 candles each, consuming 3 watts per candle. At the close of the business year, which was on June 30, 1891, the total power was 285 kilowatts with 9,517 lamps of 10 candles each. In 1900 power to the extent of 8,300 kilowatts was distributed.

On June 30, 1900, the system had a total length of 94.96 kilometers and had 539,044 kilometers of wiring, the number of meters in use being 5,710. There were 394 elevators, 191 of which were electric, 66 mixed (hydro-electric) and 137 of other varieties. The number of customers on June 30, 1900, was 5,630. The receipts amounted to an average of 11.92 francs per lamp, which gives a total of 3,852,875.80 francs against 1,422,742.85 francs total expenses, leaving net receipts of 2,430,130.95 francs, which have been used to pay off a part of 162,629.80 francs to the city of Paris and to cover the expenses of the sinking fund, interest, dividends, etc. The whole distribution system is armored lead cable and the insulation is perfect. If the conditions were modified the price of 0.15 franc per hectowatt hour, which is far too high, could be reduced; the franchise, however, being for only 18 years renders it difficult to sell at cheaper rates. The question of extending the franchise will soon be discussed in the Municipal Council of Paris, and it is hoped that it will be granted, as in this case the tariffs would be reduced.

Magnetism in Chronometers.

A special essay on this subject was presented to the Academy of Sciences at Paris during one of its last sessions by M. Cornu, who commenced with the assumption that chronometers contain steel parts which are more or less magnetized. He tried to determine the influence of the earth effect on a precision chronometer having a magnetized balance, a fact he had observed some days previous. He resumed his observations by practical instructions to navigators, regarding the important subject of the exact effect which terrestrial magnetism has on watches. It is a fact that they can be made to vary according to their positions in the magnetic meridians. It is necessary, first, to be sure that the balance of

the chronometer is not magnetized; second, to make comparative observations on the chronometer movement in the four azimuths, which might amount to several tenths per day; third, to try to put the chronometer in a box made of thick cast-iron, which would effectually scatter the lines of magnetization.

M. Mascart suggests that the chronometer should be exposed to the action of an alternating magnetic field in order to overcome this magnetization, and says that this method has previously been applied with success.

THE DESIRABILITY OF USING STORAGE BATTERIES IN MEDIUM SIZE STATIONS.*

BY L. G. WHITE.

The idea seems to be quite prevalent among central station men that the storage battery is useful only for the purpose of storing energy, generating it during light load periods and storing it until such time as it may be used to the best advantage.

The storage battery is indeed a very valuable addition to any direct current station for this purpose alone, but I shall endeavor to point out to you some other features of the storage system which I think are as fully important to the medium size station as the one before mentioned.

One of the most valuable features of the storage system is its ability to maintain an even pressure on the bus bars, to which it may be connected. Even though the load may vary greatly, and the demands may be very sudden, such as are occasioned by the starting of direct connected electric elevators and other heavy motor work, the battery will maintain a fairly even pressure at the bus bars of the station. It does this automatically and without any effort whatever on the part of the switchboard attendant.

The question of regulation has been a serious one to central station managers and is becoming more serious every day.

A few years ago the public would accept a very unsteady incandescent light, possibly attributing its unsteadiness to the belief that electricity was then in its infancy, but now, possibly thinking that the infant has had ample time to mature, they demand a bright, steady light with uninterrupted service.

It is possible that the extensive adoption of the Welsbach gas lamp, giving a very steady light though it be of a ghastly color, has had the effect of making the public more critical in the matter of electric lighting; but, whatever the cause, the fact remains that your customers demand a steady light, which means good regulation, and I think most station managers are now striving to attain that end.

I have charts taken from our recording voltmeters. These charts show the pressures at one of our heaviest centers of distribution. They are not selected specimens, but show the actual conditions covering four months; two months with the battery on the line and two months without the battery. I would remark that most of the sharp changes in the pressure were caused by a number of large passenger elevators which are connected quite close to the center of distribution, to which these volt meters are connected. So these variations of

* Abstract of paper read before the Ohio Electric Light Association, at Toledo, August 15, 1900.

pressure were not quite so pronounced over the balance of the system as it was at this particular point.

I think that the medium size station will find this one feature of the storage system fully as important to them, if not more so, than the feature usually considered by the larger stations, that is, the ability of the battery to carry enormous peak loads of comparatively short duration.

The larger stations with their large direct connected units do not experience the difficulties encountered by the smaller stations in the matter of regulation, but even they find it convenient to depend largely on the battery for regulation.

The incandescent lamp manufacturers have brought their lamps to such a point that there is but little left to be desired in the way of efficient lamps, but, in order to get good results from these high efficiency lamps it is necessary to have really good regulation. The better the regulation the better the results from the use of the high efficiency lamps.

Another feature of the storage system, which should appeal strongly to the medium size station, is that it affords a reliable reserve in case of an accident to your generating apparatus. Should an engine break down or a dynamo become disabled, the battery is usually ready to take up the load without any interruption to the service, and will usually carry it until some provision can be made to relieve it, thus saving an "out," the one thing of all others most dreaded by the station managers.

Another way in which the battery has proven itself useful and has made a direct saving of fuel and labor, is by taking care of the loads thrown on the station by sudden storms which are so prevalent in this part of the country during the summer months. Before the battery was installed it was common practice to run more boiler capacity than would have been required had it not been for the sudden jumps in the load caused by a passing thunder cloud, and even then it was frequently necessary to get in another boiler in short order, using boxes, barrels or anything that will make steam quickly, and then, perhaps, after only a few minutes' use, have to let the boiler cool off again, thus losing a large per cent. of the heat units stored in that boiler.

With the aid of the battery we are able to run both the boilers and engines in the most economical manner, thus making a saving which amounts to considerable in a year's run, and yet the saving is of such a nature that it is difficult to reduce it to dollars and cents, consequently the battery may not get all the credit due it from this source.

During the heavy winter load we find the battery very convenient in keeping up the pressure at the ends of the longer feeders. We connect such feeders as require boosting to an auxiliary bus and then connect the battery to the auxiliary, and by means of one of the end-cell switches we can raise the pressure on these feeders as high as may be necessary.

Usually that part of the load which requires boosting is so small that we would get very poor efficiency if we were to use a pair of dynamos for this purpose, but, however, should the load on these feeders be heavy enough to warrant it, we would cut in a pair of machines on the auxiliary bus to supply the load and charge the battery with whatever capacity was left in that pair of machines, so you see we would

get an economical load for the machines under all conditions.

A short circuit on heavy lines, especially if they are underground, usually means trouble for the station man and it is not an uncommon thing to have machines reversed in this manner; this of course means a shut down while fresh machines are started to repolarize the reversed machines or to burn off the short circuit. This sometimes requires a number of machines and always takes an appreciable length of time, during which your customers are saying pleasant things about electric lighting in general and about your company in particular, or perhaps are making a frantic effort to inform you by telephone that there is something wrong with their lights. We have had our usual number of short circuits since the battery was installed, but not in a single instance has the operation of the plant been affected in the least. In fact, the switchboard attendant usually learns of this kind of trouble first, from some one of the outside men. We have burned some very heavy copper and the only indication at the station has been a drop of pressure shown by the recording voltmeters and that only for an instant.

The cost of maintenance of the battery, which consists of 150 cells of chloride accumulators, has been only a very small amount in our case; the entire expense is represented by about five hours' labor per week, and about 200 gallons of distilled water per week. The water we distill in a home-made still and it costs but very little indeed. The labor is applied in reading the voltage and specific gravity of each cell about three times per week and refilling the cells with distilled water, besides keeping the battery room clean. I presume that sooner or later we will have to begin making repairs on the battery, but now after one year's constant use the plates show no evidence of deterioration.

Victory for a Trolley Company.

A jury in the New York Supreme Court on January 23, before Justice Marean, handed up a sealed verdict for the Brooklyn Heights line in a suit brought against it by Thomas Troy, a cook on a steam yacht, to recover \$10,000 for alleged injuries said to have been caused by a conductor allowing the plaintiff to stand on the footboard of an open car on September 21, 1899. Troy testified that he was knocked off the step at Third avenue and 42d street and received wounds about the head and body. It was shown to the satisfaction of the jury that Troy was negligent of his own safety.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended January 23:

Antwerp, 18 cases, \$2,535; Argentine Republic, 64 packages, \$5,410; 5 cases, \$344; Australia, 565 packages, \$42,938; 5 motor vehicles, \$2,000; 32 reels cable, \$13,029; Barcelona, 1 automobile, \$800; 10 cases, \$29; Berlin, 8 cases, \$748; Birkenhead, 2 cases, \$338; Brazil, 150 packages, \$11,843; Bremen, 62 cases, \$1,666; British East Indies, 82 packages, \$9,316; 78 cases, \$8,718; British West Indies, 41 cases, \$1,675; Central America, 132 packages, \$1,755; Chili, 32 packages, \$1,200; Cuba, 146 packages, \$3,540; Dunkirk, 22 cases, \$4,027; Dutch West Indies, 22 packages, \$474; Ecuador, 211 packages, \$879; Frankfort, 1 package, \$70; Glasgow, 212 cases,

\$4,634; Hamburg, 13 packages, \$1,538; Havre, 167 cases, \$24,729; Hull, 17 cases electrical agricultural machinery, \$2,000; Leeds, 26 packages, \$1,502; Lynn, 3 cable reels, \$840; Liverpool, 96 packages, \$7,420; London, 447 packages, \$14,524; 1 reel electric cable, \$297; Manchester, 138 cases, \$18,323; Mexico, 198 packages, \$5,596; 15 cases, \$1,825; Peru, 131 packages, \$1,282; Preston, 107 packages, \$17,400; Riga, 5 cases, \$255; Santo Domingo, 19 packages, \$327; 1 case, \$74; Southampton, 58 packages, \$2,429; U. S. Colombia, 33 packages, \$1,241; Uruguay, 18 packages, \$500; Venezuela, 4 cases, \$113.

PERSONAL MENTION.

Mr. J. G. Noyes, secretary and general manager of the National Electrical Manufacturing Company, died recently in Milford, Conn.

Mr. W. H. Parkhill and Messrs. P. M. Dawson and F. Z. McGuire, electrical engineers from London, Eng., are in this country arranging for the work on the London Underground Electric Railway.

Mr. K. W. Mansfield has been appointed superintendent of the Waterbury and New Britain Conn., railway lines, and also has direct supervision of the electric light plants in those two cities.

Mr. Isaac L. Rice, president of the Consolidated Railway, Electric Light & Equipment Company, recently returned from Europe after closing a contract with Vicker Sons & Maxim of England, for the use of the patents belonging to the company in Great Britain and Continental Europe.

Mr. Charles P. Dwight of the Great Northwestern Telegraph Company of Toronto, Ont., died last week in the Western Hospital after a short illness.

INCORPORATIONS.

The Robinson Motor Company, New York City. Capital stock, \$100,000.

The Rock River Electric Company, Beloit, Wis. Capital stock, \$50,000.

The Hoopeston Electric Light & Heating Company, Hoopeston, Ill. Capital stock, \$30,000. Incorporators: Frank Lindley, Robert Holmes and Fred B. Penwell.

The Hunter Fan & Motor Company, Fulton, N. Y. Capital stock, \$100,000. Directors: J. C. Hunter, Thomas Hunter and William Hunter, all of Fulton.

The New Jersey Electrical Construction Company, Newark, N. J. Capital stock, \$50,000. Incorporators: George W. Cook of Bloomfield, Howard C. Baldwin and Charles E. Baldwin of Newark.

The Sunset Electric Light & Power Company, San Francisco, Cal. Capital stock, \$300,000. Incorporators: J. Magnin, M. H. Schoenberg, H. W. Hunsaker, B. Sharp and others.

The Redstone Company, Santa Fe, N. M.—to engage in the lumber business and the building of electric works. Capital stock, \$25,000. Incorporators: Parthena S. Ginn, Rolla D. Ginn and Owen L. Scott.

COMMERCIAL PARAGRAPHS.

Catalogue No. II of the Clayton Air Compressor Works, 26 Cortlandt street, New York, has reached this office. This catalogue, which is handsomely gotten up, contains some 80 pages of interesting matter, describing and illustrating the many types of Clayton air compressors, air receivers, vacuum pumps, carbonic acid gas and high pressure compressors and the Clayton air-lift pumping system. Among the other contents of this catalogue will be found full information relative to the transmission of compressed air and capacity lost by air compressors in operation at various altitudes. Copies of this catalogue will be issued for gratuitous distribution and will be forwarded upon application.

Since the beginning of the new century the Sprague Electric Company opened another branch office to facilitate the handling of its constantly increasing business in the South. The new office is located in Baltimore in the Guardian Trust Building on the corner of Calvert and German streets. The Baltimore office will enable the company to keep in closer touch with the large amount of Government work constantly being done and also to handle more conveniently the increasing demand for its various products throughout the South. The manager of the new office is Mr. W. H. A. Davidson, who goes there from the New York office where he has

been for many years. He has sold Lundell motors ever since they have been on the market, and is thoroughly familiar with their characteristics and superior features. A representative of the company says that during the next four years of prosperity there will be many plants and machine shops equipped with electrically driven machines and the Sprague Company expects a large share of the business. The products of the company have long stood the test of actual service under exacting conditions and have taken front rank in their respective classes. The personnel of the company in its executive departments guarantees fair dealing and reasonable prices.

The New York Insulated Wire Company, 18 Cortlandt street, has just issued an attractive catalogue descriptive of the various types and sizes of wire and cable turned out by it. Besides a number of tables showing prices there appears the National Board of Fire Underwriters' Rules for rubber-covered wire, tables showing the carrying capacity of wires, and other information of interest to the trade.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED JANUARY 22, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

- 666,258. Electric Traction. Robert Brown, Birmingham, Eng. Filed Aug. 21, 1900.
- 666,303. Storage-Battery Transfer Car. George H. Condit, New York City, assignor to the Electric Vehicle Company, same place. Filed Sept. 3, 1898. Renewed June 28, 1900.
- 666,306. Electric Railway. Johannes W. Ehlers, Hamburg, Germany. Filed Dec. 19, 1899.
- 666,399. Street-Car Fender. Richard Thompson, Buffalo, N. Y., assignor of one-half to George E. Troup, same place. Filed April 19, 1900.
- 666,404. Rail-Bond. Montraville M. Wood, Chicago, Ill. Filed Nov. 22, 1900.
- 666,418. Electric-Car Heater. Edward E. Gold, New York City. Filed Aug. 1, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

- 666,400. Cord-Adjuster for Electric Lights. William C. Tregoning, Hartford, Conn. Filed Nov. 19, 1900.
- 666,602. Electrical Glow-Lamp. Arthur Couch, London, Eng. Filed June 11, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

- 669,255. Electric Switch and Resistance. Claude W. Atkinson, Cardiff, Eng. Filed June 2, 1900.
 - 666,315. Method of Construction of Electric Motors. Frederick A. Johnson, Binghamton, N. Y., assignor to the Stow Manufacturing Company, same place. Filed Aug. 30, 1900.
 - 666,454. Electrical Measuring Instrument. Henry P. Ball, New York City, assignor to the General Incandescent Arc Light Company, same place. Filed June 12, 1900.
- ##### TELEPHONES AND TELEPHONE APPARATUS.
- 666,444. Telephone-Exchange Central-Station Switchboard Apparatus. George K. Thompson, Malden, and Ernest C. Robes, Medford, Mass., assignors to the American Bell Telephone Company, Boston, Mass. Filed Feb. 13, 1900.
 - 666,457. Privacy Device Apparatus for Polystation Telephone-Lines. John A. Barrett, Summit, N. J., assignor to the American Telephone & Telegraph Company of New York. Filed Sept. 8, 1900.

MISCELLANEOUS.

- 666,271. Column-Printing Telegraphic Instrument. Frederick H. W. Higgins, London, Eng., assignor of one-half to Wilfred King, same place. Filed Oct. 10, 1899.
- 666,329. Lightning-Arrester. Charles A. Rolfe, Chicago, Ill., assignor to the Rolfe Electric Company, same place. Filed July 13, 1899.
- 666,361. Underground Conduit. Isaac D. Smead, Toledo, O. Filed Jan. 29, 1900.
- 666,381. Illuminated Clock. Roch R. Gareau, Detroit, Mich. Filed Dec. 18, 1899.
- 666,387. Apparatus for Producing Alkali, Electricity and Hydrogen from Alkali-Metal Amalgam. Josiah W. Kynaston, Liverpool, Eng. Filed Dec. 5, 1899.
- 666,431. Electrotherapeutic Apparatus. John S. Mead, Buffalo, N. Y., assignor to Albert W. Courtney, same place. Filed Aug. 25, 1900.
- 666,439. Sparking Igniter for Explosive-Engines. Gustav L. Reenstierna, Winchester, Mass. Filed March 3, 1900.
- 666,451. High and Low Water Alarm. Charles E. Zimmerman, Syracuse, N. Y. Filed April 6, 1900.
- 666,545. Lightning-Arrester. William N. McAnge, Suffolk, Va. Filed March 23, 1900.
- 666,586. Insulator. Henry W. Woolbert, Smethport, Pa. Filed Aug. 27, 1900.
- 666,618. Electric Igniter. Charles D. Wright, Chicago, Ill. Filed May 29, 1899.
- 666,628. Fire-Alarm. Walter J. Partridge, Norwood, Mass., assignor to the National Fire Alarm Company of Malae. Filed July 14, 1900.

THE TELEPHONE WORLD.

Another Mammoth Telephone Organization.

The Atlantic Telephone Company was incorporated at Albany January 23, with a capital stock of \$5,000,000. The company proposes to maintain a telephone system connecting New York City, Albany, Syracuse, Rochester, Buffalo and all the cities and villages along the route, which cities are also to be connected with other municipalities in the United States and Canada. The capital is divided into 50,000 shares at the par value of \$100 each. The directors are William H. Stayton, of Yonkers; John A. L. Campbell, Charles B. Reid, Arthur B. Lafar and James G. Shaw, of New York City; George H. Mann, of Brooklyn, and Warren L. Sawyer, of Nyack. William H. Stayton, when asked about the Atlantic Telephone Company, said that the company had been incorporated to establish a telephone system in New York in opposition to the New York Telephone Company, and that it was expected that long-distance connections would also be established. He said that the company had a franchise permitting it to do business in this city, and that work would be begun at once. The only patents that the company owned so far as he knew were for an improved switchboard. The first work would be to solicit subscriptions and start an exchange. The law requires 6,000 subscribers before an exchange could be installed and service begun.

Solicitor Thomas K. Leidy lately filed the application of the Schuylkill Valley Telephone & Telegraph Company at Harrisburg, Pa., asking for a charter of incorporation. The application will be heard on February 7. The incorporators are Ira W. Stratton, Fred S. Neudoerffer, Dr. Thomas H. Leidy, Orrin S. Doolittle and Louis Heilbron, all of Reading, Pa. The company has introduced an ordinance into city councils, asking permission to erect poles, string wires, etc. The new corporation claims to have sufficient capital to start operations as soon as the State charter and city franchise are granted. The telephone is to be the principal part of its business. The incorporators decline to state the amount of capital at their command, but say it is ample.

From Big Sandy, Ga., comes the report that the stockholders of the Dixie Telephone Company have elected the following officers and directors: J. F. Dowdy, president; John Pafford, first vice-president; T. V. Burton, second vice-president; U. A. Potts, secretary and treasurer. The board of directors is as follows: S. C. Cooper, chairman; Z. C. Gatlin, secretary; Ed McSwain, H. G. Brooks, P. Q. Bane, J. W. Gibson, R. C. Crockett, D. B. Thomas, W. H. Evans and B. F. Davidson.

The Muskeget life saving station is to be connected by telephone with Nantucket, Mass. A Government cable has been laid by the steamer Petrel. The first section, 1 1/4 miles long, extends from Nantucket to Tuckerneck, where a line two miles long will cross the island and join the second cable section of 2 1/4 miles to Muskeget. Herman Wagner, superintendent of construction of the life saving telephone service, is about to overhaul the entire telephone system of the life saving stations and lighthouses on Nantucket Island.

The annual meeting of the Interstate Telephone Company was held at St. Johnsville, N. Y., a short time ago, and the following directors were elected to serve the ensuing year: W. Alter, A. P. Roth, of New York City; Ed Beekman, Dr. O. B. Shedd, Fred Engelhardt, George C. Butler and H. L. Sutherland. The company's connections now reach the Adirondacks at Paul Smith's on the north, Amsterdam on the east and Frankfort on the west.

At the annual meeting of the stockholders of the Cortland J. N. Y., Home Telephone Company the following directors and officers were chosen: Dr. C. D. Ver Nooy, C. P. Walrad, R. L. Davis, William Martin, G. J. Mayer, H. L. Smith, E. L. Barber, J. S. Bralley, Jr., and W. H. Foster. President, C. D. Ver Nooy; vice-president, C. P. Walrad; secretary, H. L. Smith; treasurer, G. J. Mager; attorney, R. L. Davis; manager, W. H. Jones.

The promoters of the Independent Telephone Company are meeting with encouraging success in Detroit, Mich., and have already secured over half the number of subscribers with which it will be necessary to begin an exchange. The company will charge a five-cent rate to all points in Wayne County, and special rates to other points.

The new telephone company of Citrus and Hernando Counties, Fla., has organized and its first connection is with Ocala.

Negotiations are on foot to inaugurate telephone connections between Amesville and Barataria, La. Syndic John Graft, of Barataria, is pushing the matter vigorously.

Ferrets Used in Laying 'Phone Wires Underground.

In an Iowa town the telephone company was engaged in laying underground wires, placing them in small tubing laid in the streets. Citizens who were observing the operations, were wondering how the wires were to be placed inside those casings as the latter were laid in the ground in long sections. When ready for this operation the men produced a little bright eyed ferret, tied a light string to it and started it through the pipe. When it came out at the other end a larger string was pulled through, and then the wires which were desired. The men stated this was their regular method of operation, and although they sometimes had to wait quite a time for the ferret to come through, it was an improvement on the rod method made use of in large cities.

The use of barbed-wire telephones in San Joaquin County, Cal., is growing to such an extent as to cause grave business fears in the minds of the telephone companies. The make-shift wires are now in use in all the farm houses in some portions of that county, and farmers ring up each other as handily as they would were they city subscribers. The barbed wires strung along the fences are used as a means of conducting the vibrations.

The Port Jervis, N. Y., Telephone Company recently elected the following officers: President, Moses Dupuy; vice-president, Dr. W. L. Cuddeback; secretary, Wm. A. Parrshall; treasurer, J. Wallace Gordon. The company has 348 'phones, and is in a prosperous condition. Extensive improvements and enlargements are contemplated in the spring.

At the recent meeting of the stockholders of the Camden, Tenn., Telephone Exchange, it was ascertained that stock had been subscribed to the full extent, and the contract will shortly be given out for the erection of the system. The system has been needed a long time and is sure to prove a success.

The Tazewell, Va., telephone lines, which have heretofore been owned and managed by C. C. Long, have been formed into a stock company. The stockholders consist of C. C. Long, George W. St. Clair and B. W. Stras. The line to Tip Top will be extended to Bluefields, and a line will be built running to Cedar Bluff, which is west on to Richlands, and thence to Raven, and the mines of the Coal Creek Coal Company.

A damage suit has been settled in Tuscaloosa, Ala., for which no precedents in law could be found. O. B. Wilson was talking over a telephone during a thunder storm and was struck by lightning and killed. Suit was brought for damages and was settled by the payment of \$1,800 by the telephone company.

The annual meeting of the stockholders of the Rome, N. Y., Home Telephone Company, was held lately and the following directors elected: John S. Wardwell, Fred M. Shelley, John E. Mason, William J. Grogan, James S. Brailey, Jr., Ed. L. Barber and Robert Earl, 2d.

A citizens' mass meeting at the court-house in Lexington, Ky., recently adopted resolutions denouncing the East Tennessee Telephone Company for alleged extortion and indorsed the proposed new company.

The Warren (O.) & Niles Telephone Company has organized and elected the following officers: President, Washington Hyde; vice-president, Jules Vautrot, Jr.; manager, E. G. Miller; secretary and treasurer, J. J. McClean. A dividend was declared.

The Overland Telephone Company recently met at Lehigh-ton, Pa., and organized permanently by electing N. M. Balliet, president; A. F. Diefenderfer, vice-president; P. A. Prutzman, of Slatington, secretary, and A. P. Berlin, of Slatington, treasurer.

The Mississippi Valley Telephone Company's plant, owned and conducted in Keokuk, Ia., by J. C. Hubinger, has been sold to Chicago parties.

The Inland Telephone Company of Birmingham, Ala., will change hands the first of next month, Mr. Luke Sherrill taking charge.

The telephone line between Westmoreland and Hecla Works, N. Y., is completed and ready for future use.

An independent telephone plant will very likely be put in at Paris, Ky.

The Otisco & Cedarville, N. Y., telephone line was completed a short time ago.

The following changes in the management of the New York and Pennsylvania Telephone & Telegraph Company in Binghamton, N. Y., are announced: General Manager, W. N. Estabrook of Elmira, who retires on account of ill-health, is succeeded by H. F. Stevens of New York, who is also the secretary and treasurer of the company. E. B. Rogers, of Elmira, who was the assistant general manager, has been promoted to the position of general superintendent. District Manager W. C. Sexsmith of Binghamton, is planning to install an entirely new equipment at the local exchange, including a modern multiple switchboard and other apparatus, which will be up-to-date in every respect. The improvements are necessitated by the increase of business. In this connection an average of 31,000 connections daily are made, which is an increase of more than 500 per cent. over the business of the same period last year.

The average business man of San Francisco, Cal., who has tried to further his own interests and save his time by attempting to use a telephone during rush hours, and who has to pay the exorbitant bills of the local company for his pains, welcomes an effort that is making at Sacramento to pass a bill regulating telephone charges and bringing them under municipal direction, as are water and gas rates. The measure declares that the right to furnish telephone service is a public franchise, to be obtained only as provided by law, and which is forfeited by disregard of rates fixed in accordance with the provisions.

The citizens of Maynardville, Tenn., are agitating the matter of putting in a telephone exchange, and it is said that a number of citizens of that town are ready to organize a co-operative company, similar to that which has proved so successful at Maryville and other towns in that State. If such a company is organized, efforts will be made to have the People's Telephone Company of Knoxville build a toll line to a connection with the new exchange.

In the House of Representatives at Boston, on January 25, Representative Hunt, of Weymouth, introduced a bill to establish a rate of not more than \$100 in cities of more than 500,000 inhabitants; between 100,000 and 500,000 inhabitants, a rate of \$75; cities of from 20,000 to 100,000, a rate of \$50; and cities of less than 20,000, not exceeding \$25 for annual unlimited telephone service within a radius of 25 miles of central station.

The telephone war has struck Bath, N. Y., and the chances of cheaper telephone rates for the people of that village are exceedingly bright. Recently the village board of trustees held a special meeting to consider the application of the Bath Telephone Company for a franchise to put up poles in the streets of the village.

A telephone line will be put in Greenford, O., by the Columbiana County Company, or Independent, of Youngstown.

The Home Telephone Company of Niagara Falls, N. Y., proposes to extend its lines throughout Niagara County.

The local telephone exchange at Albert Lea, Minn., was sold a short time ago to S. H. Cady, the price being \$10,000.

The New England Telephone Company extended its line to Grange, N. H., last week.

Work will soon begin on a telephone exchange at Madisonville, Tenn.

TELEPHONE INCORPORATIONS.

The People's Telephone Company, Sardinia, O. Capital stock, \$2,500.

The Liberty Center Telephone Company, Liberty Center, O. Capital stock, \$10,000.

The Toledo, Telephone, Telegraph & Message Company, Toledo, O. Capital stock, \$25,000.

The Corning Telephone Company, Corning, Ia. Capital stock, \$10,000. Incorporators: Frank L. Mercer and J. J. Mercer.

The Daviess County Telephone Company, Gallatin, Mo. Capital stock, \$5,000. Incorporators: C. J. Bain, J. W. P. Love, M. L. Bain and others.

The Spencer Telephone Company, Spencer, Ia. Capital stock, \$15,000. Incorporators: Charles McAllister, G. G. Greaves, M. E. Griffin, M. M. Preso and F. M. Tuttle.

The Mitchell County Telephone System, Osage, Ia. Capital stock, \$50,000. Incorporators: J. W. Barrett, A. E. Roberts, G. E. Marsh, F. J. Atherton, C. R. Groves, J. W. Annis and C. F. Bennett.

GENERAL ELECTRICAL NEWS.

Lighting.

Ambler, Pa.—This village is advertising for bids to light the streets of the town.

Bremerton, Wash.—S. A. Stephens from Mt. Vernon has been here recently looking up the feasibility of putting in an electric lighting plant.

Cloverport, Ky.—The citizens of this place are agitating the question of building an electric light plant.

Dundee, Ill.—The city council of West Dundee is discussing the question of lighting its streets with electricity.

Emporium, Pa.—The borough council has decided to submit the matter of a municipal electric light plant to a vote of the people at the February election.

Fredericktown, O.—The citizens of this town are agitating the question of erecting an electric light plant.

Gary, S. D.—The question of erecting an electric light plant here is being discussed.

Hood River, Ore.—The council has received a proposition for an electric light plant.

Junction City, Ore.—This city is considering a proposition for electric street lights.

Kirkwood, Ill.—The citizens of this place are agitating the subject of establishing an electric light plant.

Lexington, Miss.—The Ice, Light & Water Company of this place elected J. E. Stanfield president, and will erect an electric light plant in the early spring.

Lisbon, O.—This city will construct its own electric light plant and operate same in connection with the waterworks.

Minden, La.—F. Drake, T. Crichton and R. H. Miller have received a franchise for the erection of an electric light plant.

Nelson, B. C.—The city council will seek authority to establish an electric light and power works at Bonnington Falls to meet civic needs.

Osborne, Kan.—C. and H. Hillebrandt contemplate the erection of an electric light plant here.

Pleasantville, N. Y.—This village has accepted Walter W. Law's proposition to light it with electricity for one half cent an hour for each lamp.

Red Lodge, Mont.—The Rocky Ford Coal Company contemplates the erection of an electric light plant here.

Sharpsburg, Pa.—At a recent meeting of the village council the finance committees were instructed to get bids on two 150 horse power boilers for the electric light and water plant. Extensive improvements are contemplated.

Smith Centre, Kan.—The people here are thinking of putting in electric lights.

Stanford, Ill.—This town is agitating the question of electric street lights.

Two Rivers, Wis.—The city council at its recent meeting granted a franchise for the installation of an electric light and waterworks plant to J. V. Miller & Co. of Chicago, to cost \$60,000.

Waitsfield, Vt.—Moriarity Brothers propose to erect an electric light plant here.

Waterloo, Ind.—Messrs. Gruhike & Flack were recently granted a franchise for lighting the streets of this city with electricity.

Street Railways.

Conneaut, O.—A charter was lately granted to the Conneaut & Erie Railroad Company with \$500,000 capital stock, with J. S. Van Cleve president. The company contemplates building an electric road from Erie to this city.

Flemington, N. J.—The Central New Jersey Trolley Company is procuring franchises for the operation of lines affecting the principal towns in Hunterdon and Warren Counties.

Gainesville, Ga.—There is talk of an electric railroad being built from the public square to the Pacolet cotton mills at New Holland, two miles distant.

Gettysburg, Pa.—This city is the objective point of three electric railroads now being planned by three separate companies of capitalists. Work will probably begin on two of the roads during the coming summer.

Greenfield, Mass.—Plans are being made for several new trolley lines in Franklin and Hampshire Counties. It is expected that Northampton and this place will be connected next summer.

Iowa City, Ia.—There is talk of building an electric line between here and Williamsburg.

Jersey Shore, Pa.—Harrisburg capitalists are preparing to construct a six-mile trolley line from Jersey Shore Junction to the village of Antes Fort.

Joplin, Mo.—J. F. Megargel and W. H. Baukington, of Scranton, Pa., have been here lately looking over the proposed route for the new electric line for which the council recently granted a franchise to F. N. Moore.

Junction City, Kan.—The War Department recently granted permission for the electric railway company in this city to build a railway from here to Fort Riley.

Manheim, Pa.—Among the various new trolley projects in Lancaster County is a line to run from here by way of Mastersonville to Mt. Gretna in Lebanon County.

Mason, Mich.—The Lansing & Southeastern Electric Railway Company has asked the council for a franchise to erect and operate an electric line.

Meriden, Conn.—The Meriden & Southington Compound Tramway Company has completed the purchase of a large tract of land between the Southington road and West Peak, and in the coming spring will build a line up the peak.

Milwaukee, Wis.—Attorney Clarence Darrow represents some Eastern capitalists who are figuring on building an electric road from this city to Lake Geneva.

Mount Vernon, Ill.—An electric railway line is projected from the town of Whittington, 16 miles south of here, on the Chicago and Eastern Illinois road, to Ewing, 3 miles east of Whittington. The chief movers in the enterprise are some Chicago capitalists, aided by a number of wealthy Ewing citizens.

Newport, N. H.—The electric road from here via Croydon, Grantham and Springfield to George's Mills is considered to be a sure thing.

Newtown, Pa.—The Northampton Farmers' Club has adopted a resolution petitioning the Union Traction Company or any other traction company to build an electric road from Willow Grove to Hatboro, Ivyland, Richboro, and thence to this place and possibly Yardley.

New York City.—The project of an electric line between this city and Boston may be carried out in the near future.

Oneida, N. Y.—There is some talk of connecting this village and Kenwood by an electric railway.

Philadelphia, Pa.—The first move toward the establishment of a trolley line from this city to Trenton was made last week.

Phoenixville, Pa.—The Phoenixville & Bridgeport Electric Railway Company will erect an electric street railway 12 miles long and it will connect with the Norristown & Philadelphia Electric Railway at Bridgeport. A 300 hp. power house will be built at Valley Forge and work on the new road will be commenced about March 1.

Spiceland, Ind.—The town board has granted a franchise for an electric line through the streets of the town to the company projecting the Muncie, New Castle and Knightstown road.

Waynesboro, Pa.—Baltimore capitalists promise to build an electric railway from here to the mountain summer resorts, four and five miles from this place, during the coming year.

Manufacturing.

Brooklyn, N. Y.—The H. Krantz Manufacturing Company of this city has recently been organized for the purpose of dealing in switchboards and electrical appliances with a capital of \$150,000. Among those interested are H. T. Krantz, A. N. Nielson, and W. M. Moore, all of Brooklyn.

Hamilton, O.—The Anness Freeman Manufacturing Company was lately incorporated with a capital stock of \$25,000. The prime movers in this new concern are:

W. H. Anness, W. P. Freeman, Louis F. Utz, Aaron Wesco and W. D. Campbell. The company will manufacture motors and generators.

Lynn, Mass.—An industry has been established by the Eastern Electric Company of Middleton, which has moved here, and will start manufacturing incandescent lamps at once. E. W. Cushing, of Boston, is president; H. H. Van Saggen, general manager, and Harry H. Hubbard, of Boston, controls the stock.

Menomoneie, Wis.—The Menomoneie Submerged Electric Motor Company, capitalized for \$100,000, will on February 1, with thirty operatives, begin manufacturing. The stockholders are mostly Menomoneie men, and include J. H. Stout as president and John Hopwood as secretary and treasurer.

New York City.—James F. Hughes, Henry E. Bailey, J. Howard Diltz, of Brooklyn; Robert A. McCord, of this city; Nathan I. E. Webb, Henry Webb and William Feirch, Greenwich, Conn., are the directors of the James F. Hughes Company recently formed here to manufacture electrical supplies with a capital of \$10,000.

Portland, Me.—The Commonwealth Motor Company has been incorporated to manufacture and deal in engines and machinery. It is capitalized at \$500,000.

St. Louis, Mo.—The Missouri Electrical Manufacturing Company has been organized in this city with a capital stock of \$20,000. Robert W. Moore, Fred B. Little and William F. Little are all interested in the concern.

Company Matters.

Lockport, N. Y.—The annual report of the Cowles Electric & Smelting Company of this city was recently filed at the county clerk's office, and is as follows: Capital stock, \$1,000,000 paid in. Debts, \$165,667.27, exclusive of capital stock. Assets, \$192,448.14.

Mechanicsville, N. Y.—The stockholders of the Hudson River Power Transmission Company of this place lately elected these directors: Gen. George S. Fields, Gen. Francis V. Greene, R. C. Bord, Gen. Edmund Hayes, George M. Furman, J. R. McKie and R. M. King. The directors elected the following officers: President, Gen. Fields; vice-president, Gen. Greene; treasurer, R. C. Bord.

Power and Transmission.

Buffalo, N. Y.—Capitalists of this city are interested in a plant to transmit electric power from Niagara Falls to Rochester.

Concord, N. H.—The Manchester Electric Company is now taking the preliminary steps looking to the erection of an electric power plant in New England at Garvin's Falls, and it is probable that ground will be broken early during the coming spring.

Automobiles.

Branford, Conn.—Louis A. Fiske, proprietor of the Branford Driving Park, is making preparations for an automobile line to connect the fair grounds with the railroad station near Pine Orchard.

Connellsville, Pa.—The Baldwin Automobile Manufacturing Company of this city, capitalized at \$250,000, made an assignment last week.

New York City.—Henry Sanderson, president of the New York Electric Vehicle Transportation Company, which operates the Fifth Avenue stage line, recently said: "We are constructing several more automobile stages at present and two of these will be placed in operation within a few weeks. They will be double deckers. By early spring we hope to have many more automobile stages in operation in Fifth avenue."

Sandy Hill, N. Y.—Preliminary steps have been taken to organize a stock company for the manufacture of an automobile patented by Joseph Barsaloux under the name of the Steering Gear Automobile Company. The officers are: President, Joseph Barsaloux; vice-president, Richard Pender; secretary, Roswell Hall; treasurer, William A. Walker.

Schenectady, N. Y.—The Iliion Automobile Works is about to be located in this city.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by **ELECTRICITY** from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Author's'd	Issued.					Author's'd	Issued.				
Albany, N. Y. - Jan 28											
United Traction Co.	100	\$5,000,000	\$5,000,000 1% Q.	111 1/2	112 1/2	Hartford Conn. - Jan 28	100	\$4,000,000	\$200,000 8% S., Oct.	100	-
(Consolidation of the Albany and Troy City Railway.)						Hartford Street Ry. Co.	100	1,000,000	247,000	-	-
Allentown Pa. - Jan 28											
Allentown & Lehigh Val. Trac Co	100	4,000,000	1,600,000	-	15	Holyoke Mass. - Jan 28	100	400,000	400,000 8% A., June	207 1/2	212
Bridgeport, Conn. - Jan 28:						Hoboken N. J. - Jan 28	25	1,250,000	1,000,000 8%	180	-
Bridgeport Traction Co.	100	2,000,000	2,000,000 1% Aug.	100	-	North Hudson Co. (N. J.) Ry. Co.	25	1,250,000	1,000,000 8%	180	-
Baltimore Md. - Jan 28						Indianapolis, Ind. - Jan 28					
United Railways & Elec. Co. com.	50	24,000,000	12,000,000	18 1/2	18 3/4	Indianapolis Street Ry.	100	5,000,000	5,000,000	27	29
Boston, Mass. - Jan 28						Lancaster, Pa. - Jan 28	100	10,000,000	9,900,000	-	-
New England Street Ry.	25	5,000,000	1,081,925 1% Q., Jan. 15	-	-	Lancaster & Col. Electric Ry.	100	87,500	-	-	-
North Shore Traction Co.	100	4,000,000	4,000,000	15	16	West End Street Railway	-	-	-	-	-
North Shore Traction Co. pfd.	100	2,000,000	2,000,000 6% S. A. & O.	85	87	Louisville, Ky. - Jan 28					
West End Street Ry. Co. com.	50	10,000,000	8% S. Oct., '99	98	98 1/2	Louisville Ry.	100	4,000,000	8,500,000 1% Q., April	92	98
West End Street Ry. Co. 8% pfd.	50	4,000,000	4% S. Jan.	112	113	Louisville Ry. pfd.	100	2,500,000	2,500,000 2% S. Oct. 1	112	118
Boston Elevated R. R.	100	10,000,000	2% S. Aug. 99	162	165	Minneapolis, Minn. - Jan 28					
Brooklyn N. Y. - Jan 28:						Twin City Rapid Transit Co. m.	100	17,000,000	15,010,000	65 1/2	68 1/2
Brooklyn City Ry.	100	2,000,000	1,928,400	238	238	Twin City Rapid Transit Co. 7% pfd.	100	8,000,000	1,712,200 1% Q. Oct.	186	187
Brooklyn Rap. Transit Co., tr. cert.	100	48,000,000	48,000,000	76 1/2	76 1/2	Montreal, Canada. - Jan 28					
Brooklyn Heights Railroad	100	200,000	200,000	107	109	Montreal Street Ry. Co.	50	4,000,000	4,000,000 8% S. M. & N.	271	278
Brooklyn City RR. guar.	100	12,000,000	12,000,000 8% Q., Jan.	247	289	Toronto Street Ry. Co.	100	6,000,000	6,000,000 1% S. J. & J.	107 1/2	107 1/2
Brooklyn, Queens Co. & Sub. RR.	100	2,000,000	2,000,000	-	-	Memphis Tenn. - Jan 28:					
Coney Island & Brooklyn RR.	100	2,000,000	1,884,200 2% S. Nov., '99	325	332	Memphis Street Railway Co.	100	500,000	500,000	25	-
Kings County Elevated	100	4,750,000	4,750,000	-	-	New Haven, Conn. - Jan 28:					
Kings County Traction Co.	100	4,500,000	4,500,000 1% July	75	80	Fair Haven & Westville RR.	25	2,000,000	2,000,000 8% S., Sept.	89	41
Nassau Electric Railroad pfd.	50	6,000,000	6,000,000	-	-	New Haven Street Railway Co.	100	1,250,000	1,000,000 2% S. A., July	-	-
Atlantic Avenue Railroad	50	2,000,000	2,000,000	-	-	New Haven & Centerville	100	700,000	800,000	-	-
Brooklyn, B. & W. R. Railroad	100	1,000,000	1,000,000	-	-	Winchester Avenue RR.	25	1,000,000	600,000	45	46
Buffalo N. Y. - Jan 28						New Orleans, La. - Jan 28					
Buffalo & Niagara Falls Elec. Ry.	100	1,250,000	1,250,000	74	75	Canal & Chalborne RR. Co.	40	240,000	240,000 4% S., July	-	-
Buffalo Railway Co.	100	6,000,000	5,870,500 1% Q. Dec., '99	99	100	New Orleans & Carrollton RR.	100	1,200,000	1,200,000 1% Q., Oct.	148 1/2	150
Columbus O. - Jan 28						New Orleans Traction Co. new com.	100	-	-	120	126
Columbus Street Railroad	100	8,000,000	8,000,000 1% Q., Feb.	33	42	New Orleans Traction Co. new pfd.	100	-	-	95	96
Columbus Street Railroad, pfd.	100	1,500,000	1,500,000	92	93	New Orleans City RR. guar.	100	2,000,000	2,000,000 8% S., Jan.	30 1/2	30
Charleston, S. C. - Jan 28						New Orleans City & Lake RR. guar.	100	2,000,000	2,000,000 4% S., Jan.	-	-
Charleston City Ry. Co.	50	100,000	100,000 8% S.	-	-	Orleans Railroad	50	500,000	185,000 1% S., June	-	-
Enterprise City RR. Co.	25	1,000,000	250,000	-	-	St. Charles Street Railway	50	1,000,000	1,000,000 1% Q., Oct.	56 1/2	57
Chicago, Ill. - Jan 28						New York - Jan 28					
Chicago City Ry. Co.	100	12,000,000	12,000,000 8% Q., Dec. 31, '99	258	257	Central Croton RR.	100	600,000	600,000 2% Q.	255	300
Chicago & South Side R. T. RR.	100	10,823,800	10,823,800	-	-	Christopher & 10th Sts. RR. guar.	100	650,000	650,000 2% Q., Oct.	175	185
Lake Street Elevated RR.	100	10,000,000	10,000,000	94 1/2	10	Dry Dock, E. Broadway & Battery RR.	100	1,200,000	1,200,000 1% Q., Nov.	120	126
Metropolitan West Side Elev. Ry.	100	15,000,000	7,000,000 Feb 28 1900.	25	28	Metropolitan Street Ry. Co.	100	45,000,000	45,000,000 2% Q., Feb. 1900	161 1/2	161 1/2
Met. West Side El., pfd.	100	15,000,000	9,000,000	79	84 1/2	Bleeker St. & Fulton Ry. Ry. guar.	100	900,000	900,000 1% A., July	85	87
North Chicago Street RR.	100	10,000,000	6,600,000 8% Q., Jan.	209	210	Brooklyn & Seventh Ave. guar.	100	2,100,000	2,100,000 2% Q.	282	240
North Chicago City RR.	100	10,000,000	249,900	197	200	Gen. Park, N. & E. Rivers RR. guar.	100	1,800,000	1,800,000 2% Q.	192	200
South Chicago City Railway	100	500,000	249,900	94 1/2	101	42nd St. & Grand St. Ferry RR. guar.	100	1,000,000	1,000,000	890	495
West Chicago St. RR. Co.	100	2,000,000	1,008,200	94 1/2	100	42nd St. & Grand St. Ferry RR. guar.	100	750,000	748,000 4% Q.	892	402
Union Traction Ry. com.	100	20,000,000	18,189,000 1% Q., Feb.	99 1/2	100	42nd St. & Grand St. Ferry RR. guar.	100	800,000	800,000	198	201
Union Traction Ry. pfd.	100	1,250,000	624,900 5% S.	12	13	42nd St. & Grand St. Ferry RR. guar.	100	800,000	800,000	198	201
Union Traction Co.	100	2,000,000	2,000,000	49	50	42nd St. & Grand St. Ferry RR. guar.	100	2,000,000	2,000,000	198	201
Cincinnati, Ohio. - Jan 28:						20th St. & Grand St. Ferry RR. guar.	100	600,000	600,000 4% Q.	100	410
Cincinnati Inc. Plane Ry. com.	50	1,000,000	875,000	-	-	Second Avenue RR.	100	2,500,000	1,862,000 2% Q., Jan.	158	201
Cincinnati Inc. Plane Ry. pfd.	50	150,000	150,000	-	-	Third Avenue RR.	100	12,000,000	10,000,000 1% S. Feb.	120	124 1/2
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000 2% S. Feb.	75	76	42nd St. & Grand St. Ferry RR. guar.	100	2,500,000	2,500,000	65	75
Cincinnati Street Ry. Co.	100	18,000,000	14,000,000 1% Q., Jan.	124 1/2	125	Union (Huck) Berry Ry.	100	2,000,000	2,000,000	190	200
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000 1% Q., Jan.	128 1/2	127	Newark N. J. - Jan 28					
Cleveland, Ohio. - Jan 28						Consolidated Traction Co. of N. J.	100	15,000,000	15,000,000	6 1/2	61
Axon, Bed. & Oliv. Elec. Ry.	100	1,000,000	1,000,000 3% Jan.	48	50	North Jersey Railway Co.	100	6,000,000	6,000,000	24 1/2	24 1/2
Cleveland City Ry.	100	8,000,000	7,600,000 8-5% Jan.	102	103 1/2	United Elec. Co. of New Jersey	100	504,000	504,000 11% S. A.	28	24
Cleveland Electric Ry.	100	12,000,000	12,000,000 3% Q., Oct., '99	88	84 1/2	Pittsburg, Pa. - Jan 28					
Detroit, Mich. - Jan 28						Allegheny Traction Co.	50	500,000	500,000	27	28
Detroit Citizens' Street Ry.	100	2,000,000	1,250,000	100 1/2	-	Consolidated Traction Co. com.	50	15,000,000	15,000,000 2% Jan.	24 1/2	28 1/2
Fl. Wayne & Belle Isle Ry.	100	1,200,000	1,200,000	175	-	Consolidated Traction Co. pfd.	50	9,478,850	8% Nov.	65	66
Rapid Railway Co.	100	250,000	250,000	90	100	Central Traction Co.	50	1,600,000	1% Nov.	74 1/2	78
Detroit Electric Railway	100	1,000,000	1,000,000	-	-	City of Detroit Traction Co.	50	8,000,000	5% A.	12 1/2	72 1/2
Windsor & Detroit River Ry.	100	250,000	200,000	100	110	Duquesne Traction Co.	50	8,000,000	5% A.	-	-
Dayton O. - Jan 28						Pittsburg Traction Co.	50	2,500,000	3% Nov.	-	-
City Railway Co. com.	100	1,500,000	1,470,600 1% Q.	140	145	Federal St. & Pleasant Valley Ry.	25	1,400,000	2% July	27 1/2	28
City Railway Co. pfd.	100	600,000	600,000 1% Q.	170	-	Pgh., Allegheny & Man. Trac. Co.	50	8,000,000	2% Aug.	41	43 1/2
People's Street Railway	100	1,100,000	1,100,000	114	115	Pittsburg & Birmingham Trac. Ry.	25	1,500,000	1% Oct.	15	15 1/2
						Pittsburg & West End Ry.	50	8,000,000	5% A., June	-	-
						United Traction Co. com.	50	17,000,000	J. & J.	15	15 1/2
						United Traction Co. pfd.	50	8,000,000	J. & J.	60 1/2	81

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.
b Leased to Boston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
g Owned by Atlantic Ave. RR. and leased to Nassau system.
h \$30 per share on outstanding capital paid as rental by lessee - West Chicago St. RR. Co.; \$250,000 of stock owned by North Chicago Street Railroad Company.
i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
j 35% per annum paid on outstanding capital as rental by lessee - North Chicago Street Railroad Company; \$625,000 of stock owned by West Chicago Street Railroad Company.
k Majority of stock owned by Chicago West Division Railway Company; 5% on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex-div.

a Leased to New Orleans Traction Company at 6% on stock.
b Leased to New Orleans Traction Company at 8% on stock.
c Leased to Central Croton Railroad at 8% on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Poyonia Ferry - now Metropolitan Street Railway.
g Leased to Metropolitan Street Ry. at 8% on stock until Oct. 1, 1907; thereafter 9%.
h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1893, at \$215,000 per annum.
i Leased to Metropolitan Street Railway for 18% on stock.
j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6% first 5 years, 8% thereafter.
k Leased to Metropolitan Street Railway for \$145,000 per annum.
l Controlled by Third Avenue Railroad by purchase.
m Dividends of 1% yearly guaranteed by Consolidated Traction Company.
n Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.
o Leased to Consolidated Traction Company for 8% per annum on par value of stock.
p Leased to Fort Pitt Traction Company for 6% on \$8,000,000 capital stock.
q Leased to Consolidated Traction Company for 4% on capital stock.
r Leased to Consolidated Traction Company for 7% on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Capital Stock.			Rate and Date of Last Div.	Bid.	Asked.	NAME.	Capital Stock.			Rate and Date of Last Div.	Bid.	Asked.
	Par	Authorized	Issued.					Par	Authorized	Issued.			
New Bedford Mass.—Jan 28	100	\$850,000	\$850,000	1 1/2 % Feb.	160	165	Boston, Mass.—Jan 28	100	50,000,000	23,050,000	4 1/2 % Q., Jan.	161	162
Union Street Railway Co.	100	800,000	225,000	1 1/2 % A., June.	170	178	American Tel. & Tel. Co.	100	10,894,600	10,894,600	1 1/2 % Q., Feb. 20,	135	137
Northampton, Mass.—Jan 28	100	800,000	225,000	1 1/2 % A., June.	170	178	Erie Telegraph & Telephone Co.	100	10,894,600	10,894,600	\$1.50 p. sh. Feb	135	137
Northampton Street Ry.	100	800,000	225,000	1 1/2 % A., June.	170	178	New England Telephone Co.	100	10,894,600	10,894,600	1 1/2 % Q., Jan.	135	137
Omaha, Neb.—Jan 28	100	5,000,000	5,000,000	8 % A. and N.	55	65	New York.—Jan 28	100	14,000,000	14,000,000	1 1/2 % Q.	91	94
Omaha Street Ry.	100	5,000,000	5,000,000	8 % A. and N.	55	65	American Telegraph & Cable Co.	100	6,500,000	6,500,000	1 1/2 % Q.	100	105
Paterson, N. J.—Jan 28	100	1,250,000	1,250,000	—	54	—	*Central & South Am. Tel. Co.	100	10,000,000	10,000,000	1 1/2 % Q.	178	175
Paterson Ry. Co.	100	1,250,000	1,250,000	—	54	—	*Commercial Cable Co.	100	1,000,000	1,000,000	1 1/2 % Q.	42	50
Providence, R. I.—Jan 28	100	8,000,000	8,000,000	5/8 % Q., Oct. '98	110	111	Franklin Tel. Co.	100	5,000,000	4,800,000	1 1/2 % Q., Feb.	116	118
United Traction & Electric Co.	100	8,000,000	8,000,000	5/8 % Q., Oct. '98	110	111	Erie Telegraph & Telephone Co.	100	5,000,000	4,800,000	1 1/2 % Q.	116	118
Philadelphia.—Jan 28	50	2,000,000	1,770,000	2 % Dec. '99.	28	24	*Gold & Stock Tel. Co. guar. 6 %	100	5,000,000	—	1 1/2 % Q.	116	118
Fairmount Park Trans. Co. \$50 pd.	50	1,966,100	1,966,100	2 1/2 % July 15, '99.	47	48	*International Ocean Tel. Co. guar. 6 %	100	5,000,000	—	1 1/2 % Q.	116	118
Hestonville, Man. & Fairmount.	50	588,900	588,900	8 % July, '99.	75	76	Mexican Telephone Co.	100	2,000,000	—	1 1/2 % Q.	116	118
Hestonville, Man. & Fairmount. 6 % pd.	50	588,900	588,900	8 % July, '99.	75	76	*New York & New Jersey Tel. Co.	100	5,000,000	8,728,000	2 1/2 % Q., Jan.	175	180
a Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	8 % Feb. 1, '99.	82 1/2	84	*Pacific & Atlantic Tel. Co. guar. 4 %	25	2,000,000	—	1 1/2 % Q.	70	75
Union Traction Co. \$12 1/2 pd.	50	30,000,000	29,980,450	—	84 1/2	84	*Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1 1/2 % Q.	95	100
a Electric Traction Co.	50	500,000	192,500	\$8 share Q.	450	451	*South & Atlantic Tel. Co. guar. 5 %	25	950,000	559,525	2 1/2 % B.	95	100
d Citizens' Passenger Ry.	50	1,000,000	1,875,000	\$14 share A.—Apr. '99	90	90 1/2	*Commercial Union Telegraph Co.	25	500,000	500,000	8 % B., Jan., '99.	115	—
e Frankford & Southwark Pass. Ry.	25	1,000,000	1,000,000	A. & O.	90	90 1/2	Western Union Telegraph Co.	—	—	97,870,000	1 1/2 % Q., Jan. '99.	83 1/2	83 1/2
f Lehigh Avenue Ry. Co.	25	1,000,000	1,000,000	A. & O.	90	90 1/2	Div. guar. by Postal Tel. Co.	—	—	—	—	—	—
g Lombard & South Street Ry.	50	1,000,000	771,076	\$9 share A., Mar. '98.	800	—	Miscellaneous.—Jan 28	25	400,000	—	1 1/2 % Q.	26	87
h Second & Third Streets Ry.	50	1,000,000	1,000,000	6 % A., April, '98.	100	—	American Dist. Tel. (Phila.)	100	8,960,000	8,561,000	2 1/2 % B.	188	—
i People's Traction Co.	50	1,500,000	572,800	\$5.25 share—1898.	150	152	Bell Teleph. Co. (of Canada.)	100	—	—	—	67	70
j Germantown Passenger Ry.	50	500,000	150,000	8 % Jan., 1898.	151	152	Chesapeake & Potomac Tel. Co.	100	—	—	—	200	210
k Green & Ocoates Passenger Ry.	25	1,500,000	740,000	—	—	—	Chicago Telephone Co.	100	750,000	750,000	—	148	150
l People's Passenger Ry. com.	25	750,000	277,402	—	—	—	Central Dist. Ptg. & Tel. Co. (Phg.)	100	750,000	750,000	—	75	76
m People's Passenger Ry. pd.	50	30,000,000	120,000,000	\$2 p. sh., Oct. '98.	100	100 1/2	Empire & Bay States Telegraph Co.	100	2,000,000	2,000,000	1 1/2 % Q.	119	120
n Philadelphia Traction Co.	50	1,000,000	400,000	6 % A.—Mar., '98.	153	157	Hudson River Telephone Co.	100	2,000,000	2,000,000	2 1/2 % Q.	122	125
o Catherine & Bainbridge St.	50	1,000,000	580,000	\$8 share—July, '98.	153	157	*Northwestern Telephone Co. guar.	50	2,500,000	2,500,000	—	16	99
p Continental Pass. Ry. guar.	50	600,000	600,000	—	—	—	Providence (R. I.) Teleph. Co.	100	8,000,000	—	—	—	—
q Empire Passenger Ry. Co.	50	1,000,000	475,000	\$7.50 share July '98	208	208 1/2	Southern New Eng. Teleph. Co.	100	8,000,000	—	—	—	—
r Philadelphia City Pass. Ry.	50	1,000,000	298,650	\$8.50 share July '98	100	—							
s Philadelphia & Gray's Fy. RR.	50	750,000	420,000	\$12 share, July '98.	308 1/2	309							
t Ridge Avenue Passenger Ry.	50	—	200,000	\$2 share July '98.	—	—							
u Philadelphia & Dart. Ry. guar.	50	—	250,000	1 1/2 % B., July, '98.	—	—							
v 17th & 19th Sts. Pass. Ry. guar.	50	1,000,000	385,000	\$11 sh. A., July, '98	300	—							
w Thirteenth & 15th Sts. Pass. Ry.	50	1,500,000	900,000	\$9.50 sh., July '98	239	240							
x Union Passenger Ry. Co.	50	750,000	750,000	\$10 share, July '98	262	263							
y West Philadelphia Pass. Ry.	50	750,000	750,000	\$10 share, July '98	262	263							
Rochester, N. Y.—Jan 28	100	5,000,000	5,000,000	—	20	23							
Rochester Railway Co.	100	5,000,000	5,000,000	—	20	23							
Reading, Pa.—Jan 28	50	1,000,000	1,000,000	Semi-ann. Jan. & Jy	24	26							
i Reading Traction Co.	50	850,000	850,000	Jan., '98.	138	—							
k City Passenger Ry.	50	1,000,000	1,000,000	Jan., '98.	70	—							
l East Reading Electric Ry.	50	1,000,000	1,000,000	Jan., '98.	70	—							
St. Louis Mo.—Jan 28	50	800,000	150,000	—	—	—							
Fourth Street & Arsenal Ry.	50	400,000	400,000	2 % Dec., 1888.	—	—							
Jefferson Avenue Ry. Co.	100	2,500,000	2,400,000	1 1/2 % Jan., '99.	—	—							
Lindell Ry.	100	2,500,000	2,479,000	1 1/2 % Jan., '99.	—	—							
National Railway Co.	100	2,500,000	2,500,000	—	—	—							
Case Avenue & Fair Grounds.	100	2,000,000	1,500,000	4 % Oct., '98.	—	—							
Citizens' RR.	100	2,000,000	2,000,000	2 1/2 % Jan., '99.	—	—							
St. Louis RR.	50	2,400,000	2,300,000	1 1/2 % Dec., '99.	19 1/2	19 1/2							
Missouri RR. Co.	50	1,000,000	800,000	50c. Dec., '89.	74 1/2	75							
People's RR. Co.	50	500,000	500,000	—	65	65							
United Electric Ry.	100	1,000,000	1,000,000	3 % Jan., '99.	68	70							
United Electric Ry. 6 % pref.	100	2,500,000	2,500,000	—	—	—							
St. Louis & Suburban Ry.	100	4,000,000	4,000,000	8 % A., July, '99.	—	—							
Union Depot RR.	100	4,000,000	4,000,000	8 % A., July, '99.	—	—							
San Francisco, Cal.—Jan	100	1,000,000	600,000	50c. monthly.	117	119							
California St. Cable RR.	100	1,000,000	875,000	\$2.80 share, '96.	61 1/2	63 1/2							
Geary Street Park & Ocean RR.	100	18,750,000	18,750,000	Q., 60c. per share.	61 1/2	63 1/2							
Market Street Ry.	100	1,000,000	550,000	—	16	—							
Fresidio & Ferries RR.	100	1,000,000	550,000	—	16	—							
Scranton Pa.—Jan 28	50	6,000,000	2,500,000	—	29	30							
Scranton Railway Co.	50	6,000,000	2,500,000	—	29	30							
m Scranton & Carbondale Trac. Co.	100	1,050,000	1,050,000	—	—	—							
n Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	—	—	—							
Springfield Ill.—Jan 28	100	750,000	750,000	—	—	—							
Springfield Consolidated Ry.	100	750,000	750,000	—	—	—							
Springfield O.—Jan 28	100	1,000,000	1,000,000	—	—	11							
Springfield Street Ry.	100	1,000,000	1,000,000	—	—	11							
Springfield, Mass.—Jan 28	100	1,200,000	1,165,700	% A.	207	212							
Springfield Street Ry.	100	1,200,000	1,165,700	% A.	207	212							
Toronto Canada.—Jan 28	100	6,000,000	6,000,000	1 1/2 % B.	210 1/2	213							
Toronto Street Ry.	100	4,000,000	4,000,000	4 % B.	210 1/2	213							
Montreal Street Railway Co.	100	4,000,000	4,000,000	4 % B.	210 1/2	213							
Washington, D. C.—Jan 28	50	500,000	500,000	—	—	—							
Belt Ry. Co.	100	12,000,000	12,000,000	65c. per sh. Oct. '99.	102 1/2	102 1/2							
Capital Traction Co.	50	400,000	400,000	6 % A.	85	40							
Columbia Ry. Co.	50	707,000	652,000	—	29	21							
Edgington & Soldiers' Home Ry.	50	200,000	200,000	—	29	21							
Georgetown & Tenallytown Ry.	50	1,000,000	468,900	2 1/2 % Q.	—	—							
Metropolitan RR. Co.	50	1,000,000	468,900	2 1/2 % Q.	—	—							
Worcester, Mass.—Jan 28	100	8,000,000	8,000,000	—	8 1/4	35							
*Worcester Traction Co. com.	100	2,000,000	2,000,000	8 % B., Feb.,	104	106							
Worcester Traction Co. 6 % pd.	100	550,000	542,500	4 % B., 1899	—	85							
Worcester & Suburban Street Ry.	100	550,000	542,500	4 % B., 1899	—	85							
Wilkesbarre, Pa.—Jan 28	100	5,000,000	5,000,000	1 % Jan.	25	29							
Wilkesbarre & Worthington Val. Ry.	100	5,000,000	5,000,000	1 % Jan.	25	29							

* Unlisted. † Paid in. ‡ Full paid. § Outstanding. ¶ Ex-div.
 a Leased to Hestonville, Man. & Fairmount Passenger Ry. for 6 % on stock per annum.
 b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
 c Practically all shares owned by Union Traction Company.
 d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
 e Lease to Electric Traction Company.
 f Lease to Frankford & Southwark Passenger Railway.
 g Controlled by People's Passenger Railway at \$5 per share.
 h Lease to People's Passenger Railway at \$5 per share.
 i Majority of stock owned by People's Traction Company.
 j Lease to Union Traction Company.
 k Lease transferred to Union Traction Company.
 l Lease to United Traction Company at a rental of \$10,000 per annum in 1896-7-8, to a \$20,000 in 1899-1900 and \$30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.
 m Dividend of 10 % guaranteed by Reading Traction Company.
 n Dividend of 6 % guaranteed by Reading Traction Company.
 o Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

Boston, Mass.—Jan 28									
Fort Wayne Electric trust receipts..	25	.....	.....	.....				115	125
* Ft. Wayne Elec Co. T. Sec. Series A.	..	..	..	..				18	25
+General Electric Co. [old] .. com.	100	40,000,000	80,460,000	2 1/2 % Q., Aug., 1898.				..	..
General Electric Co. [new] .. com.	100	18,276,000	18,276,000	1 1/2 % Q., Apr., 1900				189	189 1/2
T.-H. Elec. Co. T. Sec. Series C.	..	.....	.....	.....				22	28
Westinghouse Elec. & Mfg. Co. com.	50	.....	146,700	.....				54	65
Westinghouse El. & Mfg. Co. pfd.	50	4,000,000	8,996,068	1 1/2 % Q., Jan.,				89 1/2	70
Westinghouse El. & Mfg. Co. assent.	50	11,000,000	8,195,126	.....				44 1/2	45
New York.—Jan 28									
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	.....				119	120
* Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1 1/2 % Oct., '98.				..	..
Edison Ore Milling Co..... com.	100	.....	.....	.....				8	12
Electric Vehicle Co..... com.	100	.....	.....	.....				..	..
+General Electric Co. [old] .. com.	100	40,000,000	80,460,000	2 1/2 % Q., Aug., 1898.				..	..
General Electric Co. [new] .. com.	100	18,276,000	18,276,000	1 1/2 % Q., Apr., 1900				189	189 1/2
Interior Conduit & Insulation Co...	100	1,000,000	1,000,000	.....				41	..
1 Kings Co. El. L. & P. Co. com.	100	2,500,000	2,500,000	A. & O.				110	125
Pittsburg, Pa.—Jan 28									
Allegheny County Light Co.....	100	500,000	500,000	J. & J.				168	172
East End Electric Light Co.....	50	800,000	800,000	Q				..	..
Philadelphia, Pa.—Jan 28									
Edison Electric Light Co.....	100	2,000,000	.....	.....				144	144 1/2
* Electric Storage Battery Co. com.	100	8,500,000	.....	.....				75	80
* Electric Storage Battery Co. pfd.	100	5,000,000	.....	.....				75	80
Northern Elec. Light & Power Co..	10	550,000	550,000	.....				18	18 1/2
Southern Elec. Light & Power Co..	10	187,500	187,500	.....				80	..
Miscellaneous.—Jan 28									
Bridgeport (Conn.) Elec. Lt. Co....	25	500,000	.....	.....				47	48
Missouri-Edison (St. Louis) .. com.	..	.....	.....	.....				20	21
Eddy Electric Mfg. Co.....	25	.....	.....	.....				9	14
Hartford (Conn.) Elec. Light Co....	100	850,000	.....	.....				178	176
Hartford (Conn.) Lt. & Power Co....	25	175,000	.....	.....				6	10
New Haven (Conn.) Elec. Lt. Co....	100	100,000	.....	.....				195	..
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	.....	2 1/2 % Q., Oct.,				98 1/2	..
Rhode Island Elec. Protec. Co.....	100	.....	.....	.....				118 1/2	120 1/2
Royal Elec. Co. (Montreal) .. com.	..	1,220,000	.....	1 1/2 % Q.				106 1/2	108
Toronto (Canada) Elec. Light Co....	100	1,085,000	1,085,000	1 1/2 % Q				188 1/2	185
Thomson-Houston Welding Co.....	100	.....	.....	8 1/2 % S, Dec. 1,				..	100
Woonsocket (R. I.) Electric Co....	100	.....	.....	.....				105	100

ELECTRICITY.
BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

Albany N. Y.							New Orleans La.						
Date of Quotation—Jan 28, 1900							Date of Quotation—Jan 28, 1900						
NAME.	Amount.	Authorized.	Issued.	Dns	Interest periods.	Bid.	NAME.	Amount.	Authorized.	Issued.	Dns	Interest periods.	Bid.
The Albany Ry. Co. Cons. mtg. 5s.	\$500,000		427,500	1980	J. & J.	117½	Canal & Claiborne RR. cons mtg. 5s.	\$150,000		130,000	1912	M. & N	.....
The Albany Ry. Co. Gen. mtg. 5s.	750,000		875,000	1947	M. & N.	116½	Oreocent City RR. 1st mtg. 5s.	5,000,000		8,000,000	1899	M. & N	105½
Watervliet Turnpike & RR. 1st mtg. 5s.	850,000		850,000	1919	M. & N.	125	Oreocent City RR. Cons. mtg. g. 5s.	416,500		599,000	1908	J. & J.	108
Watervliet Turnpike & RR. 2d mtg. 5s.	150,000		150,000	1919	M. & N.	128	New Orleans City RR. 1st mtg. 5s.	5,000,000		2,599,500	1948	J. & J.	112
Troy City Railway Co. 1st 5s.	.....		.....	1942	M. & N.	116½	N. Orleans & Carrollton RR. 2d mtg. g. 5s.	850,000		850,000	1907	F. & A.	.....
Interest guar. by Albany Ry. Co. Principal and interest guar. by Albany Ry. Co.							Orleans Railroad Co. Cons. mtg. 5s. St. Charles St. RR. Co. 1st mtg. 5s. 18428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds. 1890,000 outstanding.						
Baltimore Md.							New York						
Date of Quotation—Jan 28, 1900							Date of Quotation—Jan 28, 1900						
United Electric Ry. Co. 1st mtg. g. 4s.	88,000,000		18,000,000	1949	M. & S.	102	Atlantic Ave. (Brooklyn) Imp. g. 5s.	1,500,000		1,500,000	1884	J. & J.	98
United Electric Ry. Co. Income 4s.	14,000,000		.....	1949	J. & D.	74½	Atlantic Ave. (Brooklyn) 1st gen. mtg. 5s.	759,000		759,000	1909	M. & S.	107½
Baltimore City Pass. Ry. 1st mtg. g. 5s.	2,000,000		2,000,000	1911	M. & N.	118½	Atlantic Ave. (Brooklyn) Cons. mtg. 5s.	8,000,000		1,968,000	1981	A. & O.	115
Baltimore Traction Co. 1st mtg. 5s.	1,500,000		1,500,000	1929	M. & N.	119	Brooklyn & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000		7,650,000	1904	J. & D.	128
Baltimore Traction Co. Exten. & Imp. g. 5s.	1,250,000		1,250,000	1901	M. & S.	104½	Brooklyn & 7th Ave. 1st mtg. 5s.	1,500,000		1,500,000	1904	J. & D.	104
Bal. Traction Co. No. Balto div. 1st mtg. g. 5s.	1,750,000		1,750,000	1942	J. & D.	121	Brooklyn & 7th Ave. 2d mtg. 5s.	500,000		500,000	1914	J. & J.	108
Bal. Traction Co. Coll. Trust 1st mtg. g. 5s.	750,000		.....	1900	J. & J.	101	Brooklyn Surface 1st mtg. 5s.	1,125,000		1,125,000	1924	J. & J.	115
Baltimore Traction Co. Convertible 5s.	800,000		.....	1908	N. & M.	102½	Brooklyn Surface 2d mtg. 5s.	1,000,000		1,000,000	1905	.....	105
Baltimore Traction Ry. Co. 1st mtg. 5s.	96,000		117,000	1912	J. & J.	.....	Brooklyn City RR. Co. 1st cons. mtg. 5s.	6,000,000		6,000,000	1941	J. & J.	116
Central Pass. Ry. Co. Cons. mtg. g. 5s.	801,000		880,000	1982	M. & N.	119	Brooklyn City & Newtown. 1st mtg. 5s.	2,000,000		2,000,000	1989	J. & J.	115
City & Suburban Ry. 1st mtg. g. 5s.	8,000,000		8,000,000	1922	J. & D.	114	Brooklyn Bath & W. E. RR. Gen. mtg. 5s.	1,000,000		448,000	1938	J. & J.	101
Lake Roland Elev. 1st mtg. 5s.	1,000,000		1,000,000	1942	M. & S.	117	Brooklyn Heights RR. 1st mtg. 5s.	250,000		250,000	1941	A. & O.	104
* All of the bonds of the above companies, marked +, have been assumed by the United Railways & Electric Company.							Brooklyn, Q's Co. & Sub'n. 1st mtg. 5s. Brooklyn, Q's Co. & Sub'n. 1st cons. 5s. Brooklyn Rapid Transit. gold 5s. Bleeker St. & Fulton Ferry RR. 1st mtg. 7s. Cent Pk. N. & E. R. RR. 1st cons. mtg. 4s. Central Crostown RR. 1st mtg. 5s. Coney Island & Brooklyn RR. 1st mtg. 5s. D. Pock, E. B'd'y & Rar'y R. gen. mtg. g. 5s. Dry Dock, E. B'd'y & Rar'y R. scrip 5½. Eight Ave. RR. Co. Cert. Indeb't. 6½. 42d St., Man. & St. Nich. Av. 1st mtg. 5s. 42d St., Man. & St. N. Av. 2d mtg. inc. 5s. Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s. Metropolitan St Ry Co. g. m. cl. tr. g. 5s. Second Avenue Ry. Gen. cons. mtg. 5s. Second Avenue Ry. Deb. 5s. Steinway Ry. (L. I.) 1st mtg. g. 5s. South Ferry RR. Co. 1st mtg. 5s. Third Avenue RR. 1st mtg. g. 5s. Twenty-third Street Ry. 1st mtg. 5s. Twenty-third Street Ry. Deb. 5s. Union (Huckleberry) Ry. 1st mtg. 5s. Westchester Electric RR. 1st mtg. 5s. 181,085,000 in escrow to retire gen. mtg. bonds. 184,850,000 in escrow to retire maturing obligations. 18552,000 in escrow to retire 1st and 2d mtg. bonds. In treasury, \$80,000. Guar. by Union Ry. Co.						
Boston Mass.							Toronto Canada						
Date of Quotation—Jan 28, 1900							Date of Quotation—Jan 28, 1900						
Lynn & Boston RR. 1st mtg. g. 5s.	5,879,000		8,702,000	1924	J. & D.	114	Montreal St. Ry. 1st mtg. 5s.	2,500,000		800,000	1902	M. & S.	.....
West End Street Ry. Deben. g. 5s.	8,000,000		8,000,000	1902	M. & N.	104½	Toronto St. Ry. 1st mtg. g. 4½s.	4,550,000		2,200,000	1927	M. & S.	.....
West End Street Ry. Deben. g. 4½s.	2,000,000		2,000,000	1914	M. & S.	112	1885,000 per m. single track authorized. 8600,000 in escrow to retire 5s due in 1901						
181,674,000 in escrow to retire outstanding bonds of absorbed companies.							Philadelphia.						
Charleston S. C.							Date of Quotation—Jan 28, 1900						
Enterprise Street RR. 1st mtg. 5s.	500,000		47,000	1906	J. & J.	.....	Continental Pass. Ry. 1st mtg. 5s.	850,000		810,000	1909	J. & J.	.....
Charleston City Ry. 1st mtg. 5s.	850,000		.....	.....	J. & J.	106	Empire Pass. Ry. 1st mtg. 7s.	800,000		500,000	1900	J. & J.	.....
Controlled by Charleston St. Ry. Co.							Greene & Coates St. Ry. 1st mtg. 5s.						
Chicago Ill.							Lombard & So. St. Pass. Ry. 1st mtg. 5s.						
Date of Quotation—Jan 28, 1900							People's Pass. Ry. 1st mtg. 7s.						
Chicago City Ry. 1st mtg. 4½s.	6,000,000		4,619,500	1901	J. & J.	101½	People's Pass. Ry. 2d mtg. 5s.	500,000		458,000	1911	J. & J.	.....
Chicago Passenger Ry. 1st mtg. 5s.	400,000		400,000	1908	F. & A.	.....	People's Pass. Ry. Cons. mtg. 5s.	1,125,000		867,000	1912	M. & S.	.....
Chicago Passenger Ry. Cons. mtg. 5s.	1,000,000		600,000	1929	J. & D.	.....	People's Pass. Ry. Stk. tra. cert. g. 4s.	5,698,210		.....	1948	.....	.....
Chicago & So. Side R. T. 1st mtg. g. 5s.	7,500,000		7,800,000	1929	A. & O.	.....	Phila. City Passenger Ry. 1st mtg. 5s.	200,000		200,000	1910	J. & J.	.....
Chicago & So. Side R. T. 4½s.	1,500,000		750,000	1907	J. & J.	.....	Philadelphia Trac. Co. Coll. tr. g. 4s.	1,800,000		1,018,000	1917	F. & A.	.....
Chicago West Div. Ry. 1st mtg. 4½s.	4,040,000		4,040,000	1982	J. & J.	108½	Thirteenth & 15th St. Ry. 1st mtg. 7s.	100,000		100,000	1908	A. & O.	.....
Lake Street Elevated RR. 1st mtg. g. 5s.	7,874,000		8,781,200	1928	J. & J.	.....	Union Passenger Ry. 1st mtg. 5s.	500,000		500,000	1911	A. & O.	.....
Metrop. W. Side Elev. Ry. 1st mtg. g. 5s.	15,000,000		15,000,000	1942	F. & A.	96	Union Traction Co. Coll. tr. 4s.	29,735,000		29,724,876	1945	A. & O.	.....
North Chicago St. RR. 1st mtg. 5s.	8,171,000		8,171,000	1906	J. & J.	106	West End Passenger Ry. 1st mtg. 7s.	.....		.....	190		
North Chicago St. RR. Cert. Indeb't. 5s.	500,000		500,000	1911	J. & J.	.....	West Phila. Pass. Ry. 1st mtg. g. 5s.	250,000		246,000	1906	A. & O.	.....
North Chicago City Ry. 1st mtg. 5s.	500,000		500,000	1900	J. & J.	.....	West Phila. Pass. Ry. 2d mtg. 5s.	750,000		750,000	1926	M. & N.	.....
North Chicago City Ry. consol. 4½s.	2,500,000		2,500,000	1927	M. & N.	108	The trust certificates were issued to pay for the shares of the Electric and People's Traction Lines purchased.						
West Chicago St. RR. 1st mtg. 5s.	4,100,000		8,969,000	1928	M. & N.	111	Pittsburg Pa.						
West Chicago St. RR. Deben. 5s.	2,700,000		700,000	1911	J. & D.	101	Date of Quotation—Jan 28, 1900						
West Chicago St. RR. Cons. mtg. g. 5s.	12,500,000		6,000,000	1986	.....	106½	Birmingham, Knox & Allentown. 5s.	500,000		500,000	1901	M. & S.	111½
W. Chicago St. RR. Tunnel. 1st mtg. 5s.	1,500,000		1,500,000	1909	F. & A.	.....	Central Traction Co. 1st mtg. 5s.	875,000		875,000	1980	J. & J.	.....
Redeemable at option on 60 da. notice. Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee. Subject to call after Oct. 1, 1899, at \$110 and interest. Assumed by W. Chi. RR. Co., lessee Int. guar. by W. Chicago St. RR. Co.							Citizens' Traction Co. 1st mtg. 5s.						
Cincinnati O.							Duquesne Traction Co. 1st mtg. 5s.						
Date of Quotation—Jan 28, 1900							Fed'l St. & Pleasant Valley. Cons. 5s.						
Cin. New & Gov. St. Ry. 1st Cons. mtg. g. 5s.	8,000,000		2,500,000	1922	J. & J.	114½	Fed'l St. & Pleasant Valley. Cons. 5s.	1,250,000		1,250,000	1942	J. & J.	.....
Mt. Adams & Eden Pk In. 1st mtg. 5s.	46,000		46,000	1900	A. & O.	108½	Millvale, Etta & Sharpsh. 5s.	750,000		750,000	1928	M. & N.	110
Mt. Adams & Eden Pk In. 1st mtg. 6s.	100,000		100,000	1905	A. & O.	114	Pittsburg, Crafton & Mansfield. 5s.	250,000		250,000	1924	J. & J.	.....
Mt. Adams & Eden Pk Inc. Cons. mtg. 5s.	581,090		581,000	1906	M. & S.	108½	Pittsburg Traction Co. 1st mtg. 5s.	750,000		750,000	1927	A. & O.	.....
So. Cov. & Cin. St. Ry. 1st mtg. 5s.	250,000		250,000	1912	M. & S.	121½	Pittsburg & Birmingham. 1st mtg. 5s.	1,500,000		1,500,000	1929	M. & N.	112
So. Cov. & Cin. St. Ry. 2d mtg. 5s.	400,000		400,000	1982	J. & J.	182½	Pittsburg & West End. 1st mtg. 5s.	500,000		500,000	1922	J. & J.	.....
Assumed by the Cin. St. Ry. Co. 1920,000 reserved to retire 1st mtg. bds.							Pittsburg & West End. 2d mtg. 5s.						
Cleveland O.							Pittsburg & West End. Gen. mtg. 5s.						
Date of Quotation—Jan 28, 1900							Second Ave. Traction Co. 1st mtg. 5s.						
Brooklyn Street RR. Co. 1st mtg. 5s.	600,000		600,000	1908	M. & S.	106½	Sub. Rapid Transit Railway Co. 5s.	500,000		500,000	1912	W. & S.	.....
Cin. New & Gov. St. Ry. Cons. mtg. 5s.	8,000,000		2,500,000	1922	J. & J.	118½	Providence R. I.						
Cleveland City Cable Ry. 1st mtg. 5s.	2,000,000		2,000,000	1909	J. & J.	106	Date of Quotation—Jan 28, 1900.						
Cleveland Electric Ry. Co. 1st mtg. g. 5s.	8,500,000		1,249,000	1918	M. & S.	106	Newport Street Ry. Coupon 5s.	50,000		50,000	1910	J. & D.	.....
Columbus (O.) Cent. Ry. 1st mtg. g. 5s.	1,500,000		1,500,000	1918	M. & N.	.....	United Trac. & Elec. Co. 1st mtg. g. 5s.	9,000,000		8,260,000	1988	M. & S.	116
Cleveland RR. 1st mtg. 5s.	1,000,000		1,000,000	1910	M. & S.	107½	St. Louis.						
Fl. Wayne (Ind.) Elec. Ry. 1st mtg. g. 5s.	600,000		.....	1922	M. & N.	.....	Date of Quotation—Jan 28, 1900						
Lorain (O.) Street Ry. 1st mtg. 5s.	200,000		200,000	1915	J. & J.	.....	Baden & St. Louis RR. 1st mtg. 5s.	250,000		250,000	1918	J. & J.	101½
St. Ry. Co. Grand Rapids. 1st mtg. 5s.	600,000		600,000	1912	J. & D.	.....	Cass Ave. & Fair Gds Ry. 1st mtg. 5s.	1,818,000		1,818,000	1912	J. & J.	101½
181,900,000 in escrow to retire bonds of absorbed companies, marked a. Interest guar. by Cons. St. Ry. Co.							Citizens' Railway Co. 1st mtg. 5s.						
Detroit, Mich.							Comp. Hts. Un. De. & Mer. Ter. 1st						
Date of Quotation—Jan 28, 1900							Cin. Ave. & Fair Gds Ry. 1st mtg. 5s.						
Detroit Citizens' St. Ry. 1st mtg. 5s.	7,000,000		8,885,000	1905	A. & O.	102½	Date of Quotation—Jan 28, 1900						
Fl. Wayne & Belle Isle Ry. 1st mtg. 5s.	400,000		877,000	1902	A. & O.	.....	Baden & St. Louis RR. 1st mtg. 5s.	250,000		250,000	1918	J. & J.	101½
The Detroit Ry. 1st mtg. 5s.	1,800,000		1,800,000	1926	J. & D.	106	Cass Ave. & Fair Gds Ry. 1st mtg. 5s.	1,818,000		1,818,000	1912	J. & J.	101½
181,150,000 in escrow to retire bonds of Del. City Ry. and Grand River St. Ry.							Citizens' Railway Co. 1st mtg. 5s.						
New Haven Conn.							Comp. Hts. Un. De. & Mer. Ter. 1st						
Date of Quotation—Jan 28, 1900							Cin. Ave. & Fair Gds Ry. 1st mtg. 5s.						
New Haven St. Ry. 1st mtg. g. 5s.	600,000		600,000	1918	M. & S.	111	Date of Quotation—Jan 28, 1900						
New Haven (Edgewood Div.) 1st mtg. 5s.	250,000		250,000	1914	J. & D.	111	Baden & St. Louis RR. 1st mtg. 5s.	250,000		250,000	1918	J. & J.	101½
Winchester Avenue RR. 1st mtg. g. 5s.	100,000		500,000	1912	M. & N.	109	Cass Ave. & Fair Gds Ry. 1st mtg. 5s.	1,818,000		1,818,000	1912	J. & J.	101½
Winchester Avenue RR. Deben. g. 5s.	1,000,000		24,000	1919	M. & S.	.....	Citizens' Railway Co. 1st mtg. 5s.	2,000,000		1,500,000	1907	J. & J.	109

PASSENGER RAILWAY.

Bonds	Amount.		Due	Interest periods	B. d.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—Jan 28 1900						
Jefferson Avenue Ry.....1st mtg. 5a.	400,000	400,000	1908	M. & N.	108	106
Lindell Ry. Co.....1st mtg. 5a	1,500,000	1,500,000	1911	F. & A.	108	109
Missouri R.R. Co.....	1,000,000	700,000	1916	M. & S.	105	106
Mount City R.R. Co.....1st mtg. 5a.	400,000	800,000	1910	A. & O.	100	102
People's R.R. Co.....1st mtg. 5a.	125,000	125,000	1902	J. & D.	.....	.....
People's R.R. Co.....2d mtg. 7a.	75,000	75,000	1902	M. & N.	.....	.....
People's R.R. Co.....Cons. mtg. 5a.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & R. St. L. Electric.....1st mtg. 5a.	75,000	75,000	1906	J. & J.	100	101
St. Louis R.R. Co.....1st mtg. 5a.	2,000,000	2,000,000	1900	M. & N.	99%	100%
St. Louis & Sub. Ry.....1st mtg. g. 5a.	3,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5a.	800,000	800,000	.....	.....	80	84
Southern Electric Ry.....Cons. mtg. 5a.	500,000	500,000	1909	M. & N.	106	108
Taylor Avenue St. Ry.....1st mtg. g. 5a.	500,000	500,000	1918	J. & J.	116	118
Union Depot R.R. Co.....1st cons. mtg. 5a.	1,091,000	1,091,000	1900	A. & O.	100	100%
Union Depot R.R. Co.....Cons. mtg. 5a.	8,500,000	1,787,000	1918	J. & J.	121	122
Controlled by St. Louis R.R. Co.						
Controlled by Union Depot R.R. Co.						
Controlled by Lindell R.R. Co.						
\$200,000 in escrow to retire 1st & 2d mtg.						
\$500,000 in escrow.						
\$200,000 in escrow to retire 1st mtg. bds.						
San Francisco Cal.						
Date of Quotation—Dec 1900.						
California St. Cable R.R.....1st mtg. g. 5a.	1,000,000	900,000	1915	J. & J.	114	117
Ferriss & Oliff House Ry.....1st mtg. 5a.	650,000	650,000	1914	M. & S.	.....	117
Geary St. Park & Ocean R.R.....1st mtg. 5a.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. g. 5a.	8,000,000	8,000,000	1918	J. & J.	126%	.....
Metropolitan Ry. Co.....1st mtg.	300,000	.....	.....	.....	.....	.....
Omnibus Cable Co.....1st mtg. 5a.	2,000,000	2,000,000	1918	A. & O.	126%	.....
Park & Oliff House R.R.....1st mtg. 5a.	850,000	850,000	1912	J. & J.	105%	107
Park & Ocean R.R.....1st mtg. 5a.	250,000	250,000	1914	J. & J.	115	.....
Powell St. Ry.....1st mtg. 5a.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co.....1st mtg. g. 5a.	1,000,000	900,000	1918	M. & N.	.....	.....
Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Jan 28, 1900						
Belt Ry. Co.....Cons. mtg. 5a.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 5a.	500,000	500,000	1914	A. & O.	182	.....
Exington & Soldiers' Home.....1st mtg. 5a.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan R.R. Co.....Coll. tr. cons. 5a.	500,000	500,000	1901	J. & J.	.....	.....
\$250,000 in escrow to retire 1st mtg. bds.						
Miscellaneous.						
Date of Quotation—Jan 28, 1900.						
Bridgeport Traction Co.....1st mtg. 5a.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 5a.	5,000,000	8,548,000	1981	F. & A.	118	.....
C. (Hens) St. R. (Ind. polis) 1st cons. m. 5a.	4,000,000	8,000,000	1988	M. & N.	104	10%
Croton St. Ry. (Buffalo) 1st mtg. 5a.	8,000,000	3,866,000	1982	M. & N.	112	118
Columbus (O.) St. Ry.....1st cons. g. 5a.	8,000,000	2,261,000	1982	J. & J.	115	.....
Consolidated Traction (N. J.) 1st mtg. 5a.	15,000,000	18,965,000	1988	J. & D.	111%	111%
Croton St. Ry. (Columb., O.) 1st mtg. g. 5a.	2,000,000	572,000	1988	J. & D.	115	115%
Denver City Cable Ry.....1st mtg. g. 5a.	4,000,000	8,800,000	1920	J. & J.	20	.....
Denver Con. Tram'y Co.....Cons. m. g. 5a.	4,000,000	922,000	1988	A. & O.	80	85
Louisville (Ky.) Ry.....1st cons. mtg. g. 5a.	6,000,000	4,981,000	1980	J. & J.	119	119%
Minneapolis St. Ry. 1st cons. mtg. g. 5a.	5,000,000	4,060,000	1919	J. & J.	110%	110%
No. Hudson Co. Ry. (N. J.) Cons. mtg. 5a.	8,000,000	2,878,000	1928	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.) 2d mtg. 5a.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.) Deb. 5a.	500,000	489,000	1902	F. & A.	.....	.....
Patterson (N. J.) Ry.....Cons. mtg. g. 5a.	1,250,000	1,000,000	1981	J. & D.	.....	.....
Rochester (N. Y.) Ry.....1st mtg. 5a.	8,000,000	2,000,000	1980	A. & O.	.....	.....
St. Paul City Ry.....Cons. g. 5a.	5,500,000	4,298,000	1987	.....	105%	108
St. Paul City Ry.....Deb. g. 5a.	1,000,000	1,000,000	1900	.....	108	.....
\$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
\$200,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
\$750,000 in escrow to retire bonds of C. St. R.R. Co.						
\$27,000 in treasury.						
\$250,000 reserved to redeem prior liens						
\$250,000 in escrow.						

*With int'res

ELECTRIC LIGHT AND ELECTRICAL MFG. COOS

Boston, Mass.						
Date of Quotation—Jan 28 1900.						
Delaware Gas Lt. Co.....1st m. 5a. g.	800,000	800,000	.....	J. & J.	106	108
Edison Elec. Illuminating Co., Boston.....	2,026,000	.....	.....	Quar.	187	.....
General Electric Co., gold coup. deb. 5a.	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa.						
Date of Quotation—Jan 28, 1900						
Allegheny County Light Co.....	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Scrip. 5a.	195,570	.....	.....	M. & S.	.....	.....
Miscellaneous.—(Jan 28 1900.)						
Elison El. Ilg. Co. (N. York) 1st m. 5a.	4,812,000	4,812,000	1910	.....	109	.....
Elison El. Ilg. Co. (N. Y.) con. m. g. 5a.	15,000,000	2,188,000	1998	.....	124	.....
Elison Elec. Ilg. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122%	124
Elison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5a.	2,500,000	.....	1987	A. & O.	100	10%
Kings Co. El. Lt. & Po. Co. pur. money 5a.	5,176,000	.....	1997	A. & O.	120	122
Milwaukee El. Ry. & Lt. Co. 1st con. g. 5a.	8,000,000	.....	.....	F. & A.	102%	.....
United Elec. Light & Power Co. (N. Y.).....	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous						
Date of Quotation—Jan 28 1900.						
American Bell Telephone.....4s.	.....	.....	1908	F. & A.	100%	101
Northwestern Telegraph Co.....7s.	.....	.....	.....	.....	.....	.....
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 5a.	.....	.....	.....	.....	114	116
Chesapeake & Potomac Teleph. Co.....5s.	.....	.....	1911	J. & D.	108	106

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—Jan 28 1900						
American Electric Heating.....7s.	500,000	500,000	.....	.....	.....	.....
Armington & Sims Engine Co.....	.....	.....	.....	.....	.....	25
Barnes & Smith Car Co.....6s.	.....	.....	1942	J. & J.	106	107
Carborandum Mfg Co.....6s.	.....	.....	1904	J & D.	.....	.....
Worthington Pump Co.....	75,000	.....	.....	.....	115	127
Unlisted						
Nominal						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16 $\frac{1}{2}$ @ 16 $\frac{3}{4}$ c.; Lake, 16 $\frac{1}{4}$ @ 16 $\frac{1}{2}$ c.; casting, 16 $\frac{1}{2}$ @ 16 $\frac{3}{4}$ c.

The annual meeting of the Telephone, Telegraph and Cable Company of America will be held February 12.

Advices from Boston state that over \$1,000,000 of the \$7,500,000 Erie Telephone 5 per cent notes have already been placed.

Business failures in the United States last week numbered 306, against 231 the same week last year; in Canada there was 46, against 38 last year.

The New England Telephone & Telegraph Company has declared a dividend of \$1.50, payable February 15. Books close January 31 and reopen February 15.

It is stated that the Philadelphia Union Traction Company's net earnings for December last showed an increase of about \$15,000 over the figures for December, 1899.

The General Electric Company of New Jersey will soon absorb the Plainfield (N. J.) Electric Light Company. The former company purposes to absorb all the lighting plants of New Jersey.

The Westinghouse Electric Company has declared the regular quarterly dividend of 1 $\frac{1}{2}$ per cent. on the assenting stock, payable February 15. Books close February 5, and reopen February 21.

The German Secret Process Steel Ball Company of New York was chartered at Dover, Del., January 25. It purposes to deal in steel, copper, brass, aluminum, and other metals. The capital is \$7,000,000.

The Philadelphia Electric management is credited with having bought \$2,000,000 of the company's 4 per cent. bonds for the purpose of retiring them. This was done out of the proceeds of the last call.

The Chicago Union Traction Company will pay the regular quarterly dividend of 1 $\frac{1}{2}$ per cent. on the stock of the West Chicago Street Railway Company, which it guarantees, on February 15. Books close February 5.

The Coney Island & Brooklyn Railroad Company has declared the regular quarterly dividend of 2 $\frac{1}{2}$ per cent. and an extra dividend of 2 per cent., payable February 1. The rate heretofore has been 2 $\frac{1}{2}$ per cent. without extra.

The Lancaster (Pa.) Light & Power Company will be incorporated soon, with a capital of \$5,550,000, to absorb the Conestoga Traction Company, the Lancaster Railway Company, the Lancaster Gas, Light & Fuel Company and the Edison Electric Light Company.

The Staten Island Electric Railway Company reports for the quarter ended December 31, 1900: Gross earnings, \$41,660; operating expenses, \$30,240; net earnings, \$11,420; other income, \$184; total income, \$11,604; fixed charges, \$25,000; deficit, \$13,396; profit and loss deficit, \$163,681.

The Manchester Traction, Light & Power Company has been incorporated in New Hampshire with \$1,500,000 capital. The stock has been placed with Tucker, Anthony & Company of Boston. An issue of \$1,500,000 5 per cent. bonds has been sold to Vermilye & Company of New York.

The directors of the Chicago Telephone Company have decided to issue \$1,000,000 new stock in April. It will be delivered April 8 at par to shareholders of record March 27. This will make the stock outstanding at that time \$8,000,000. In all probability another \$1,000,000 will be issued in October. The proceeds of the sale of these additional shares will be devoted to the payment for extensions and improvements.

Directors of the Roanoke Railway & Electric Company have authorized a payment of 3 per cent. on the issue of \$190,000 of the income bonds of that company. This is after providing for the payment of the interest on the \$300,000 first mortgage bonds, and leaving a surplus, which was carried to the sinking fund. This is the first payment to be made on the income bonds, which are largely held in Baltimore.

The Hudson River Telephone Company has declared the regular quarterly dividend of 1 $\frac{1}{4}$ per cent. and an extra dividend of 1 per cent., making the total dividends for the year 6 per cent. The dividends are payable February 1 to stocks of record January 22. It is the intention of the company to continue dividends at the rate of 6 per cent. per annum. The company did a large business last year and also made extensive improvements. After the dividends are paid there will be a good-sized surplus remaining.

At the annual meeting of the stockholders of the Minneapolis General Electric Company held in Jersey City on January 7 the following directors were elected: E. S. Webster, E. Wadsworth, M. B. Koon, H. K. White, E. A. Merrill, C. A. Stone, L. S. Cushing, Russell Robb and J. B. Dill. These directors held a meeting on January 21 at which the following officers were elected: President, M. B. Koon; treasurer, E. S. Webster; secretary, E. Wadsworth. A dividend of \$3 per share was declared, payable February 1 to preferred stockholders of record January 21. Transfer books closed from January 21 to February 1 inclusive.

The annual meeting of the stockholders of the Brooklyn Rapid Transit Company was held on January 25. The following directors were elected: A. N. Brady, August Belmont, H. C. Duval, A. R. Flower, E. H. Harriman, R. Somers Hayes, J. G. Jenkins, W. G. Oakman, H. H. Porter, Clinton L. Rossiter, Henry Siebert, G. H. Valentine and Col. T. S. Williams (secretary). The re-election of the directors quieted rumors about changes of interest which have been in circulation for several days. The directors met on Monday at the office of Anthony M. Brady, 54 Wall Street, and re-elected President Rossiter and the old executive officers without change. A statement given out shows the net receipts for ten months operation in 1900 to have been \$2,235,904.69, an increase of \$450,548.93 over the previous year.

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EDITORIAL NOTES.

Prof. Pupin Has an Alleged Rival.

There is hardly ever an invention of any importance brought out, but what some one springs up to claim a prior conception of the idea and device. This has been the case with Edison's ore milling process and innumerable other valuable devices by well-known men. Just because a man happens to think in a general way that electricity might with advantage be applied to doing so and so, and never acts on his thought, and several years later the very idea, which he cherished in idleness and as being solely his, is enlarged and perfected by another party who has probably spent months and much money in so doing, it by no means follows that the credit of the invention should be taken from the real inventor and given the dreamer. And yet in nine cases out of ten the latter feels aggrieved unless this is done.

Some six months ago Prof. Pupin, of Columbia University, described at a meeting of electrical engineers an invention which he had made, and which would allow of vocal messages being transmitted along a submarine cable over distances heretofore prohibitive. How he achieves this—doing away with induction and condensation—has been explained many times in the technical press of late, but in a word it is accomplished by inserting specially devised induction coils at frequent intervals in the cable. Recently the rights to this method of telephony were sold to the American Bell Telephone Company for half a million dollars, whereupon a resident of Chicago comes forward and claims priority of invention. This gentleman, according to a Chicago daily paper, asserts that he perfected a similar system, and tested it two years ago. It is also alleged that he conceived the idea twelve years ago. Referring to this subject he is reported as saying: "My invention consists of a system of inserted relays 200 miles apart, whereby I can by the use of ordinary telegraphic wires now in use communicate to any distance articulate sounds—that is, words. I do not know the details of Pupin's invention, but I do know that he requires more relays than I do."

Thus the chances are there may be a long-drawn out suit in the near future—as the Chicago gentleman proposes to begin an action—which will benefit no one but the lawyers, and

which may possibly prevent the public from receiving the benefits of the device as soon as it would otherwise. If the Western inventor considered that Prof. Pupin's system infringed on his, why did he not come forward months ago and say so, rather than wait until the eleventh hour before taking any action?

Some Wonderful Ideas.

The dawn of the new century is apparently deemed a fitting time by inventors and scientists to bring forward startling theories and to utter preposterous statements which are eagerly sought after by the daily papers, and served up by them to the unsophisticated public with voluminous illustrated trimmings.

Not long ago our friend Nikola Tesla allowed himself to be heard from again, and informed a representative of the press that while experimenting in wireless telegraphy in Colorado, his receiving instrument responded to extraneous electrical vibrations or signals, which Mr. Tesla, with his usual vivid imagination, immediately concluded came from the planet Mars. Less enthusiastic scientists think the signals referred to were due to local electrical disturbances in the atmosphere. That such is the case would seem probable, for admitting that Mars is inhabited by intelligent human beings, is it likely that we have reached the same stage of development that they have, or vice versa; or that the Martians are making use of electrical vibrations, rather than some other force of which we at present know nothing, to attract our attention, assuming of course that the residents of Mars do think of us, which it is barely possible is not the case. So much for the Mars sensation.

To send coal by wireless telegraphy is another one of the wonderful ideas that seem to have been born with the new century. A doctor of Chicago states—in a daily paper of course—that within a very short space of time it will be possible, after reducing coal into a gaseous form, to send it through the air on a wireless electric circuit, to be reduced at the place of destination to a solid, and to be sold as coal with the original qualities of the product as dug from the mines. How the learned doctor proposes to accomplish this is not definitely stated, but it is understood that electrolysis is expected to play an important part in the operation. Incidentally it might be pointed out, that were Nikola Tesla and the Chicago doctor to go into partnership they might control and

corner the coal supply of the world—which is growing less—by importing coal from Mars on etherial waves.

There is not the slightest doubt but what the world is progressing, and that schemes that would have seemed visionary to our great grandfathers are in practical operation to-day, but these changes have come gradually and not by starts and jumps. Nikola Tesla is unquestionably a great scientist with a wonderful mind, but as an engineer put it recently, when referring to him, he is one or two hundred years ahead of his time.

* * *

England Worrying About Its Trade.

Apparently the English press is stirring things up on the subject of the decline of British trade. The daily papers

are harping on the subject in a more or less discouraging vein, which has forced the technical press to take up the matter in an effort to defend and encourage the home manufacturers of electrical machinery and apparatus. The "Electrical Review" of London objects to the statement made recently by Mr. Alfred C. Harmsworth regarding the excellent outlook in England for American made automobiles and trolley cars, while in "Feilden's Magazine" there appears an editorial which among other things says:

"Signs, however, are not wanting to lead us to believe that the war against apathy, unsatisfactory and superficial as it perhaps has been, has not been without results in effecting a stimulus to some portion of Britain's manufacturers, as the adoption of the bonus system and the purchase of up-to-date tools, which are putting the more progressive firms a long way on the road towards attaining an increased output, will testify.

"English tool makers themselves have been awakened more particularly by actual stress of foreign competition to the necessity of modernizing their products, and the golden harvest reaped by American tool makers in this country for years past, instead of perhaps proving what at first appeared to be a very unfortunate circumstance, may be in a measure condoned in that our own tool makers have been enabled thereby to benefit largely from the American models."

This article, after admitting that the British tool manufacturer has been obliged to adopt American models, states that the above mentioned magazine has taken the trouble to dispatch a commissioner to the United States, who will visit the chief industrial centers in this country with a view to ascertaining why, to put it in plain language, the machinery manufactured in Great Britain cannot as a rule successfully compete with that made on this side of the Atlantic. Referring to the subjects the commissioner will investigate the editorial says:

"Among his general instructions, one of the chief is that which relates to the question of comparative productivity, that is, in other terms, the return upon invested manufacturing capital. It may be stated that the industrial product of every hundred pounds invested is very much higher in the United States, where it is the common aim of the men to work every machine up to its highest standard of production, than it is in this country.

"It is evident that the question of labor and the conditions of labor prevailing in the United States, compared with the trades unions of

this country, is an all-important element in this question, and our representative has instructions to give the values, speeds and products of machinery his principal attention."

It is only natural that English publications should take a just pride in upholding the products of home manufacturers, but this does not alter the fact that American electrical apparatus and kindred machinery is steadily gaining a foothold in that country in spite of anything the British manufacturers have been able to do. And this will continue to be the case as years go by, and our exports to that country will grow larger rather than smaller, as the immense aggregation of capital at the command of our larger manufacturers permits them to immediately relegate to the scrap heap out-of-date machinery and tools to be replaced by utensils of the most modern pattern. Thus is it possible to turn out and market first-class machinery at a minimum price. The report of "Feilden's" special commissioner should prove interesting reading.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

THE Municipality of Berlin has just paid 10,000,000 marks for the Siemens-Halske tramway, the most important street railroad system in the German capital. The Prussian Government is preparing to run electric railroad trains at 25 miles an hour.

THE 21st meeting of the New York Electrical Society was held on January 30 at the Edison Station of the New York Gas, Electric Light, Heat & Power Company. Dr. Louis Bell delivered a lengthy lecture, entitled "Electric Illumination at the Beginning of the Twentieth Century," an abstract of which will be found elsewhere in this issue. The meeting was unusually well attended and after the lecture a most appetizing collation was served. The 212th meeting of the Society will be held at the College of the City of New York, 23d street and Lexington avenue, on Thursday, February 14, at 8 P. M. Mr. Kempster B. Miller, whose writings on the subject of telephony have made him the foremost exponent of the art in this country in technical literature, will address the Society on "Modern Telephone Engineering." This will be the first lecture on telephony which has been delivered in New York City in many years, and will constitute a most important review of the engineering situation.

As a result of a brief interview had with Mr. C. O. Baker of Baker & Company relative to the situation of the platinum market, we learn that platinum has never been so high as at the present time, this notwithstanding the fact that the demand has never been greater. All indications, as a result of this condition, point to an early and substantial increase in the present quotations.

It is stated that electric power from the Niagara River is to play a part in agriculture in that region. A power company has contracted with several farmers to run transmission lines to their farms, and it is the intention of the farmers to place electric fans over their peach trees and run them at night. It is claimed a circulation of air will prevent frost and that orchard owners in Delaware have made similar ex-

periments with success. The saving of a peach crop from frosts, early or late in the season, is worth a great deal to the orchard owner; it means the rescue from loss of all the rest of the season's work. If power is cheap and ready and the application of it is efficacious, the idea may have merit.

A MAINE man is said to have invented an auto sled, which presents some departures from the previous lines of experiment. The sled is to be 10 feet long, about 3 feet high and somewhat more than 4 feet wide.

PROF. A. SLABY of the "Berlin Technische Hochschule," in the course of a remarkable interview on "The Coming Electrical Revolution," asserts that his recent invention, multiplex wireless telegraphy, will produce a great transformation in existing methods. It will be possible, he declares, to apply the principle to submarine cables in such a way as to send hundreds, and even thousands, of messages simultaneously on the same wire, thus enormously cheapening rates. Prof. Slaby believes that the problem of direct production of electricity from coal will be solved. Germany, he predicts, will be the foremost nation of the twentieth century in technical production and electricity will be the poor man's source of power and light. He is confident of the success of the electrical express locomotives now being constructed in Berlin for a speed of 200 kilometers an hour.

AN enterprising man in Buffalo, N. Y., has rented a large tract of vacant property near the Exposition grounds, on which he proposes to erect several hundred substantial tents. These will be of different sizes and will be rented by the week at rates which can only be considered most reasonable, when they are compared with the prices that hotels will naturally charge. Arrangements may be made to light these tents by electricity and also to use the heating power in electric ranges for culinary purposes.

AN automatic electric fire alarm has recently been invented by Dr. W. Jay Brewster of Port Ewen, N. Y. The invention consists of a plurality of thermostats, one of which is placed in each room of a building; an alarm bell is also placed in each room. The thermostats are in open cases or boxes, which are 6½ inches long, 2½ inches wide and one inch deep. Connecting with a thermostat and extending from it around the entire room is a small metallic perforated tube, which is secured in a depression of the base or mop-board. Inclosed within this tube is a compound which is extremely sensitive to the influence of fire. This, as will be seen, makes a continuous thermostat reaching from the central thermostat case to all parts of the room. In each room so equipped the thermostat case is in electrical communication with the alarm bells of each and every other room of the building and with an annunciator which may be placed in any room desired. In a building thus equipped, should a fire occur in any part of any room, instantly a general alarm is sounded in every room of the building and the annunciator will show the number of the room in which the fire has occurred.

THE cost of a horse power per hour, in different sorts of motors, has been studied by M. Charvet, says the N. Y. "Sun." Some of his results are of general interest. A French laborer working eight hours in turning a crank

at a wage of about 70 cents per day produces one horse power hour at a cost of 85 cents. An ox turning a horizontal bar 13 feet long (as in some grinding mills) produces the unit at a cost of 23 cents. A horse doing the same kind of work travels much faster than the ox, and the unit of work costs a little less than 20 cents. A six horse power steam engine (working 150 days each year and ten hours per day—as is customary in farm work) produces the unit of work at a cost of about 4 cents. The petroleum engine is considerably more economical in operation, but its work in France costs about 7 cents on account of customs duties. The wind-mill produces its unit of work at 2 cents, but the most economical form of motor is the water wheel. A water wheel whose first cost is about \$160 per horse power produces a unit of work at a cost of less than 1 cent, and turbine wheels are even more economical.

FLORIDA is to be connected with Cuba by an undersea telephone line. The termini of the line have not been announced but it is stated that the Bell Telephone Company has determined to construct it, applying the invention of Dr. Michael I. Pupin, from whom the company recently purchased it.

Two electrical furnaces have been installed in the physical chemistry department of McGill University, Montreal, through the aid of which many interesting experiments can be made. The furnaces have a capacity of 110 volts, and are large enough to take a current of 100 amperes. The principal use to which these furnaces, with their immense heat of 3,000 or 4,000 degrees centigrade are to be put is the splitting up of compound substances into their component parts, with most important results for commercial purposes. They will also be used for the manufacture of diamonds, a process discovered by M. Moissan, the famous French chemist. The study of the diamond fields of South Africa convinced him that great heat and great pressure has been the agents that turned carbon into the diamond. He therefore fused in the electric furnace carbon and iron at enormous heat, and then cooled the compound off rapidly, thus subjecting the carbon, mixed with it, to a terrific pressure, resulting in the formation of true diamonds, answering all the tests of the natural gem. The artificial product is as yet, owing to size, of no more than scientific value.

The new electric railway at Paris has proved a great success, despite the mishaps that have occurred thereon from time to time. From the date of its opening on July 19, until October 31, 13,000,000 passengers were carried. Occasionally the daily number of passengers carried amounted to 170,000. It was originally intended to run only 270 trains per day, but this number has been considerably increased, and further trains are to be added.

THE Dominion Government will propose to Parliament on an early date the purchase of the Canadian Pacific Railway telegraph lines, also the lines of the Great Northwestern Telegraph Company, and operate the whole as a part of the Post Office work, just as is done in Great Britain. The purchase money is calculated to reach \$25,000,000 or over, but as the two concerns duplicate in almost all centers of the Dominion, the Government can count on reducing working expenses by almost one-half. The legislation will provide for one of the

chief officers of the British Government Service acting as arbitrator in case of differences as to prices. Under any circumstances the shareholders will be amply protected. The chief inducement for the proposal is to secure a British and Colonial Government line round the world, and the scheme will be greatly favored in Britain.

THE chimes of St. Patrick's Cathedral, in this city, consist of 19 bells, ranging in weight from 270 to 6,000 pounds, and having a musical range from lower "C" to upper "D," with the accompanying sharps and flats. For the ringing of these bells the plan decided upon comprises a keyboard about 18 inches long, fashioned like that of a typewriter, to be placed in the sacristy. This may be operated with ease by anyone having a knowledge of music. In addition there is an automatic clock mechanism which is to render the "Angelus" and the "De Profundis" four times daily. In adapting the switch-signal system to bell ringing, 19 bell engines, corresponding to the number of bells, were constructed. These bell engines are bolted to wooden seats, which in turn are bolted on a system of steel beams inserted in the walls of the north tower. These engines consist in their working parts of a fine grade of bronze composition metal, so as not to rust or corrode. The engines practically consist of three main parts, two cylinders and a piston, which is fitted to a clip hung on the clapper of the bell above it. On the engine there is an adjustable clevis, so that the stroke can be arranged to a nicety, and once so adjusted it cannot change its position. The engines are operated from the sacristy by means of a keyboard. A key being depressed, a current of electricity is sent along its wire to the belfry, where, by means of an air-valve operated through an electro-magnet, the compressed air is admitted to the bell engine, and the air pressure delivers the blow, which acts upon the clapper and rings the bell.

A CABLE dispatch from France states that during the recent heavy snow storm in Paris many serious accidents occurred in connection with the surface contact system of electrical propulsion in use on the Rue Quatre Septembre. Owing to the pressure of so much moisture, the studs in the middle of the track, usually harmless, were charged with current, with the result that when a person placed one foot on a rail and the other on a stud he received a shock.

SOME time ago we referred in a short item to the fact that in Germany it was proposed to use peat as a fuel for generating electricity. The "Electrical Engineer," London, now states that the matter has been fully considered by Dr. Franks, and he estimates that a hectare of turf 3 millimeters thick gives 2,500 tons of dry turf, equivalent to 1,200 tons of coke, or, in English measure, an acre of turf 10 feet thick gives 1,000 tons of dry turf equivalent to 480 tons of coke. The mosses of the Evus Valley, which cover an area of 1,000 square miles, might furnish the equivalent of 300,000,000 tons of pit coal—that is to say, more than the total production of Germany for three years. The turf would be burnt at central stations of 10,000 hp. capacity, consuming annually 200,000 tons of turf, the product of 200 acres of the beds. One application of the power produced would be to the service of the canal connecting Dortmund to the Ems, which will soon be finished, but the

writer thinks the most interesting will be the manufacture of acetylene, the materials for which can be obtained easily and cheaply in the neighborhood. With 10,000 hp. a quantity of acetylene can be produced daily equivalent for lighting purposes to 150,000 gallons of petroleum, or annually in value to 20,000 tons of foreign imported petroleum.

AMERICAN engineers according to a daily paper have secured the contract for the equipment of the first electric road in the city of Tokio, Japan. A. L. Bagnall, of the American engineering firm of Bagnall & Hilles, of Yokohama, Singapore and Manila, which concern has been awarded the contract, is now in New York for the purpose of placing orders aggregating \$300,000. Of the contracts already let New York concerns have secured orders amounting to \$150,000. Referring to the project he says: "The road, which is to be called the Tokio Electric Railway will be thirty-five miles long. The system is to be operated through the principal thoroughfares of Tokio on to Kawasaki; nine miles distant, in the direction of Yokohama. It is proposed to connect Tokio with Yokohama, a distance of twenty miles. According to the specifications drawn up by the Japanese officials, it was specially stipulated that the car bodies and trolley poles were to be made in Japan; also that Cammell rails and Babcock & Wilcox boilers must be supplied. In the open market such contracts would most assuredly have been placed in the United States."

IN Norway, as in Sweden, at present there is a great deal of agitation for the working of short-distance railways by electricity, the power being obtainable from the numerous waterfalls in both countries. In many towns, according to the London "Electrician," the tramways are already worked by this force generated by accumulators. However, the first railway line in Norway to be worked by water and electric power will be that from the town of Holmestrand on the Christiana Fjord to the Villingfos, a beautiful waterfall much visited by tourists. The line is to have a length of 25 miles, and will be ready for traffic next summer. There is already a generating station at the fall. A second electric line will be that from the town of Fredrikshald to the Tiste River, to be worked with a large single car driven by electromotors.

THE well-known French astronomer and writer, M. Camille Flammarion, has for some time been making a special study of the effects of lightning on men, animals and other objects, and in order to illustrate the freakish conduct of lightning he recently told some stories which seem incredible. Thus he tells of two peasants who were preparing to eat breakfast, when suddenly all of the dishes were thrown on the ground, the bread, cheese and fruit vanished from the table and they themselves were covered with straw. On another occasion a man, walking through Nantes, was enveloped in lightning, yet was not injured. When he reached home, however, and opened his purse, which had contained two pieces of silver and one of gold, he found that the gold piece had vanished and that in its place was a silver piece. The lightning had, in fact, pierced through the leather of the purse and had covered the gold piece with a coating of silver taken from the other two pieces.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 13.

THE THREE-WIRE SYSTEM.

One of the principal objects to be attained in installing an electric light plant is to secure the required efficiency at the least possible expense in copper for carrying capacity.

When incandescent electric light was first introduced the tremendous cost for copper for distribution, even in small cities, was the greatest retarding feature to the industry, and the engineers at once directed their attention to devising systems whereby a reduction in the amount of copper necessary could be secured and at the same time attain as great a lighting capacity. One of the results was the three-wire system of distribution.

There is always a loss of pressure in an electric current when it flows through a conductor, the loss being equal to the product of the resistance of the wire and of the amperes of current. Then when a number of incandescent lamps are fed from a circuit at a considerable distance from the supplying source, the wires of the circuit must naturally be quite heavy in order that the loss in pressure shall not be too great.

On an incandescent lighting circuit it is common to allow a loss of pressure or "drop" amounting to as much as 10 per cent., and sometimes even as high as 20 per cent. when working at its full capacity. The circuit should be arranged so that all the lamps on it shall be fed with current at as near a uniform pressure as possible, and if the drop allowed is too great this becomes a difficult matter on account of the continual change in the amount of current flowing as a result of lamps and motors being turned on and off the circuits.

If the voltage at the central station or supplying source can be increased then the amount of current required to accomplish an equal amount of work will be proportionately decreased, and as a result a greater amount of work can be done over the feeders and distributing lines of the system, or, in other words, the carrying capacity of the system can be proportionately increased as the amount of current required to do a certain amount of work is decreased, still maintaining an equal efficiency to the plant.

But to increase the voltage above a certain point on a multiple incandescent lighting system is not practical. First, because it has been discovered that incandescent lamps do not have as long a life when manufactured to operate at a higher pressure than 110 or 115 volts; second, there are too many objections to using high voltage on interior wiring.

If on a circuit of 110 volts pressure there are operating ten 16 cp. incandescent lamps, the amount of current that would be flowing over the circuit would be practically five amperes. Suppose the circuit were operated at 220 volts, and the lamps were connected two in series and a multiple of five, as in Fig. 1, then the amount of current flowing would only be two and one half amperes and we would be able to operate just twice as many lamps on the cir-

cuit with the same carrying capacity; but here we would meet with a serious objection because the lamps would have to be used two at a time or a multiple of two and also if one lamp burned out the other one in its circuit would not operate. This would not be a very convenient arrangement.

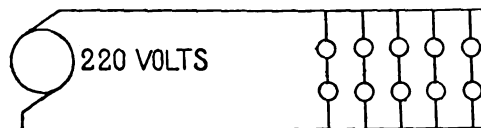


FIG. 1.

One way of securing the 220 volts pressure would be to connect two 110 volt dynamos in series. Suppose that were done, but instead of just using the two outside wires in feeding the circuit, the center or connecting wire is also run out, making three wires in the operating circuit, as in Fig. 2.

You will observe that this is practically operating two distinct circuits except that one of the conductors is made common to both circuits. This common conductor is known as the neutral wire.

Referring to Fig. 2, let us observe what advantages may be derived by operating in this manner. If each dynamo were operated at a pressure of 110 volts, then between the conductors A and C there would exist a pressure of 220 volts and between A and B or C and B there would exist only a pressure of 110 volts.

The conductor B would be negative to the circuit A B, and positive to the circuit B C. Now if ten 16 cp. lamps are connected in each of the circuits as described in the figure, then the system would be what is known as balanced, that is, there would be no current flowing in either direction in the conductor B and the lamps would operate just the same if the conductor B were disconnected entirely from the dynamos. You will readily see how this is, because if 10 lamps are operating on each circuit there will be five amperes tending to flow back on the conductor B to the dynamos and also five amperes tending to flow out on B, because, as we said before, the conductor B is positive

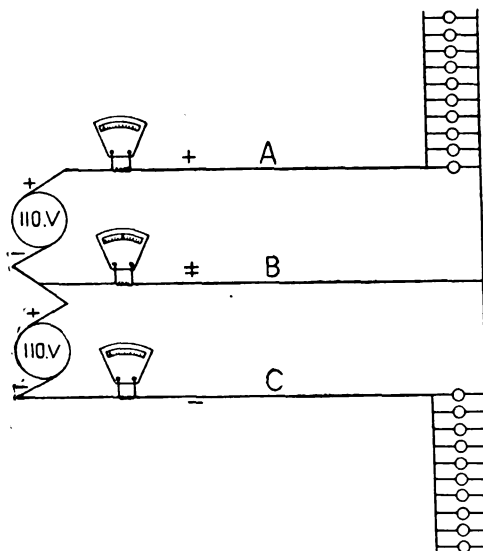


FIG. 2.

to one circuit and negative to the other circuit. If this condition exists then there will be no current flowing in the conductor B and the current flowing through the lamps on one side will also flow through the lamps on the other side. The ammeters on the lines A and C would read the same and the ammeter on B would remain at zero.

Suppose there are twenty lamps operating on the circuit A B and only ten on the circuit B C, then there would be 10 amperes tending to flow back on the conductor B and only 5 amperes tending to flow out on it. So if we have a plus ten and a minus five the actual current flowing in B would be five, or just equal to the difference in the current used in each circuit or side of the system.

Now we see the function performed by the neutral conductor. It takes up the difference between the two circuits if they are not balanced, and the ammeter on that circuit will show the amount of difference or unbalance, and the reading of it should be exactly equal to the difference between the readings of the ammeters on A and C.

This is a very popular method of operating and exercises quite a saving in copper in a plant, for while using 110 volt lamps on the circuit yet it is practically operating at 220 volts pressure and as the pressure is increased the amount of current required to do an equal amount of work will be proportionately decreased and consequently a less carrying capacity in the conductors be required to accomplish an equal amount of work.

Article No. 14 will be entitled "Alternating Currents."

THE TRADE EDUCATION OF CENTRAL STATION EMPLOYEES.*

(Concluded from page 58)

WHAT A CENTRAL STATION COURSE OUGHT TO CONTAIN.

Your committee has endeavored to do the utmost justice in its examination of each of the schools. It approves the idea of correspondence instruction as being an excellent one in its place; it believes that good is coming from the correspondence schools; and it has satisfied itself that the administrative methods of the schools are reasonably well planned. Each of the courses, however, which belong to the second and third categories named previously, can and must be greatly altered before they are adapted to be of the greatest use to central station employees and through them to their employers. The ideal central station course should contain very much less of "design" and much more relating to good construction and economies in operation. Your committee here outlines a course which it believes would meet the requirements of the average central station employee, and which would result in great advantage to the central stations if the employees followed it.

COMMITTEE'S COURSE.

1. Arithmetic (for those who need it).
2. A small amount of elementary algebra, geometry and trigonometry.
3. Erection and use of steam boilers.
4. Fuel and its economical combustion.
5. Boiler operation and boiler tests (this should include the methods and reasons for testing flue gases, testing the quality of steam, the use of feed water heaters, economizers, etc.).
6. Erection and operation of steam engines.
7. Testing of steam engines (this should include use of the indicator, testing to determine friction, the consumption of water per indicated horse power per hour, valve testing etc.).

* Abstract of a report of the Committee of the Northwestern Electrical Association, appointed to consider the advisability of central station managements encouraging their employees to enroll themselves in courses of correspondence schools.

8. Condensers, pumps and other auxiliaries.
9. Steam piping and steam pipe covering.
10. Ohm's Law and electro magnetic theory (this would include electrical instruments, flow of currents, etc.).
11. Erection, operation and repairs of direct current electrical machinery.
12. Elementary theory of alternating currents (single phase and polyphase).
13. Erection, operation and repairs of alternating current machinery.
14. Switchboards and switchboard instruments.
15. Electrical transmission and distribution lines and accessories.
16. Construction, testing and repairs of pole line and underground circuits.
17. Meters and meter repairs.
18. Electric lamps.
19. Station economies and station records.
20. Transmission and distribution economies and distribution records.
21. Storage batteries and their uses.
22. Telephones and their accessories.

Theorems of applied mechanics, strength of materials and other related subjects are to be suitably treated at points of application.

A properly written course of lessons following this outline should take an industrious employe about one and one-half years to cover the ground. Such a man should be expected to spend perhaps six hours of study each week outside of the working period. The course could be successfully administered in the system of existing correspondence schools. The course aims at producing in the corps of employes a working knowledge of the means for obtaining the highest possible economy available from the machinery and appliances installed by the central station company, and the possibility of improving the economy by minor alterations. This course would surely be successful in its aim, and it would result in great improvement in the character of the work of employes of the average central station company, if followed by them, and through them in advantage to the company.

The answer to the interrogatory of the second head has been outlined. The administrative methods of existing correspondence schools will give excellent results when combined with a properly adapted course, such as that outlined by the committee, but the existing courses of the schools are not fully and properly adapted to average central station requirements.

THIRD HEAD.

What Provisions May Central Station Owners Reasonably Supply for the Purpose of Encouraging Their Employes to Study the Requirements of their Business and How May Those Provisions be Executed?

Your committee is firmly convinced that the central station companies can lend their employes great assistance by providing a perfectly adapted course of correspondence instruction. It is probable that one or more of the existing correspondence schools will arrange such a course if its need is made known through action of this Association. In the administration of this course it is desirable to add to the processes now made a part of the electrical course some means for practical demonstration of central station methods. The demonstrations should relate particularly to the methods of firing coal, testing flue gases testing the quality of steam, indicating engines etc. Analogous demonstrations are made to railroad employes by the International Correspond-

ence Schools through traveling instruction cars which carry complete outfits of air brakes and other train devices. That which can be done for railway employes can be done for central station employes, and the central stations should make every effort to bring before their employes complete instruction that is the equal in its kind to the instruction offered to railway employes by the International Correspondence Schools.

Prizes, free payments of scholarship fees, and other provisions for encouraging the employes to enter correspondence courses do not hold out reasonable advantages except in a few individual cases. Personal encouragement of the ambitious men who are well endowed with common sense, and the provision of a suitably planned and administered course of instruction which such employes may enter upon, will bring the greatest advantage to the central station companies. It is on these lines that the central station companies must look in large degree for the improvement of their operating conditions.

The required course with its administration can either be had through one or more of the correspondence schools as suggested by the committee or through a subscription fund administered after the manner of the "Gas Educational Fund" of the American Gas Light Association.

Your committee recommends that action be taken requesting the correspondence schools to organize and administer a course of instruction for central station employes which conforms to the recommendations of this committee; and that the committee be continued for further investigation of the results obtained through correspondence instruction.

Respectfully submitted by the Committee,
DUGALD C. JACKSON, Chairman,
Member of the N. W. Elec. Assn., Professor of
Electrical Engineering in the University of
Wisconsin.

F. A. COPELAND,
Ex-President of the N. W. Elec. Assn., President of the La Crosse Edison Light & Power Company.

HENRY L. DOHERTY,
Ex-President of the N. W. Elec. Assn., President of the Madison Gas and Electric Co.

DISCUSSION.

H. J. Gille, St. Paul, Minn.—I move that a vote of thanks be extended to Prof. Jackson and the other members of his committee for the very able paper, and that the committee be continued.

The motion was carried.

By unanimous vote, the recommendations of the committee were adopted.

Prof. Jackson, Madison, Wis.—I move that the four correspondence schools referred to in the report be individually requested to reorganize their courses for central station employes, to conform, as nearly as possible, with the requirements set forth in this report.

The motion was seconded and carried.

Mr. Bowen—I want to say that I am heartily in accord with the matter contained in this motion. Great difficulty has been found, as is indicated in this paper, in getting the specific education which is demanded of the employes in various processes. For instance, the cost of the manufacture of gas per thousand feet rests very largely with men generally without education, who operate the gas works, and it goes without question, I think, that the cost

per kw. at the switchboard rests very largely with the men who are operating electric plants. It is throwing a great deal on your committee to ask them to enter into further correspondence with these correspondence schools for the purpose of getting them to remodel their courses, and yet something must be done along that line, but you must not forget that you are burdening your committee. Your committee will be obliged to take the courses that are offered by the correspondence schools, after their revision, and see that they are right. There is no correspondence school that can educate a gas employe. We have found that out to our cost. But they can educate them along the general line, the principal one being just this, that each of the courses proposed by these correspondence schools takes up entirely too much time—in other words they ask these fellows that handle the shovel to study algebra—that is about the size of it. There is nothing in the way of practical education quite so good as sending a man right into the retort house or into the gas generating house to show him how to get the results, and when he gets through under good experienced tuition, he knows something, and much more than under the tuition of the correspondence schools; but a course should be arranged, so concise, so plain and so short and pertinent to the subject matter, that no mistake can be made. Now if this committee will go ahead and invite these schools to adopt courses recommended by the committee, it will be the best work ever done by a committee, and I hope that this committee will do this work and that the result will be what I think it will be if this present committee is continued.

Mr. Livermore—It is just possible that we central station managers would like very much to have all our men experts in their individual daily occupation. At the same time the general tenor of the correspondence school, while it includes arithmetic, algebra and trigonometry, is to elevate the men. If we want a man to become a perfect fireman we do not want to lose him, but to have him stay there, and my idea of the correspondence school scheme of education, is to take a poor fellow who never had any chance to go to school, but had to go to firing when he was 15 or 16, and give him a chance to learn something during his spare hours, so that some day he may rise to be a superintendent. I know several such cases where men have moved rapidly up from lower to higher positions by the aid of these schools. I think some of the courses are too long, but some of them are comparatively short. They have a course for professional linemen and in side electric wiring men; and while it is not necessary to know algebra to be a fireman, yet the whole purpose of the course is to advance men. It is to advance the man who never had a chance when he was a boy to go to school, didn't have the money—the object of the whole thing is to start from the ground and build up.

Mr. Gille—It seems to me that the point brought out in this report, that the percentage of students that finish that course is very low indeed, would indicate that there is something wrong. There is quite a number of employes in my department who have started with this correspondence school—there are probably thirty who have started and only one that has finished—and I have inquired several times why this was. It was simply because they had to go over a lot of stuff they did not under-

stand and did not care anything about. They would jump through and pick out matters that interested them particularly, or that they believed would do them good, and it seems to me that the recommendations made by this committee are practical, that a man in whatever station he happens to be should have a future to look to, and he gets not only a general knowledge of the operation of the plant, but he gets a very good idea as to the machinery itself and the system.

Mr. Almer—In connection with this matter, if it is in order, I want to state an experience I had about a year ago. I took the lesson leaves of probably the first correspondence school that came out—it is not in existence now—and took all the primers, inspectors, and wiremen that I had and gave them these leaves to read from, and once a week all through the winter I held a little lecture, and went over these lesson leaves and explained them, and asked the men questions, and the result was that I obtained very much better work from the men, but I have only one of those men left, and he has advanced three or four points. The others have found better positions elsewhere. So I have the same task to do over again.

Mr. Cutter—The remarks of the last speaker interest me immensely. It proves the value of the course. The paper itself is rather a surprise. We are proud to have had a committee to give such a report on this topic. We are proud that this Association is handling this important question of educating men to do their work better, and we are glad that committee has gotten it down to a practical basis. We all understand that the man that is running a dynamo and has some little trouble with it, he would like at that particular time to know what the mischief is the trouble. He does not want to go through a long course of algebra or trigonometry to do that. It seems to me that the suggestion of the committee is especially pat. Of course I would like to see some method by which the employes of the stations could ask questions pertaining to their business, from the correspondence schools if possible. If not, I would like to see some method introduced by which those employes could ask questions from a source where they could receive correct information at the time that particular point of interest is before them. I would also like to see the central station managers encouraging their employes to take up such a course, especially after it has received the stamp of approval of such an able committee as we have on this matter.

Mr. W. L. Elliott, Chicago—I never said a word in this Association before, but it seems to me that the education should begin with the head of the house, the man who is more liable to stay there than the fireman. The idea of the committee is perfect and should be adopted, but in our house we are pulling 100 percent more load than we were two years ago and at a less cost. Let the head of the house take the full course and hold his own class. Then the station pays the expenses and the employe gets the advantages free, and the proprietor should always be willing to advance the interests of his own men.

Mr. Ben Strong—The gentleman suggested that he had lost his employes—I guess it was because they learned too much to stay with him—I mean that they learned so much that they went off and secured a better job. Some other station man probably benefited at your expense.

PRACTICAL LINE CONSTRUCTION.*

BY LOREN W. BURCH.

This is a subject that should have been given a more fluent writer. How to construct a pole line correctly has undoubtedly agitated many minds before now. In the early stages of construction a great amount of groping and feeling in the dark was indulged in and when we see some of the work that is done to day it looks as though daylight had not yet come for some of us. Pole line construction has permitted a vast amount of fanciful ideas, emanating from the minds of those therein engaged, because no specifications have as yet been produced to form a standard which could be followed with success.

The importance of good line construction is made apparent by the increased expenditures caused by a poorly constructed line. It may be that a line repair account is not kept; under such circumstances it is possible that the line itself is not kept in proper repair. Keeping the line in good condition and keeping a strict account of the same should go hand in hand. A line poorly constructed means a waste in dividends; money spent for repairs on work originally badly done, that should have entered into the first cost, is worse than money thrown away. To construct a first class pole line at the start is to save money and give character and stability to the line and increased value to your property. It will also inspire confidence in your customers and bring forth words of praise that mean business for the plant.

There are three great evils which are always at work doing their best to defy success in almost all kinds of construction. In pole line work we find first, ignorance; second, false economy; third, dishonest contractors. No matter how good a standard you might have, any of these elements is enough to work sad ruin to an investment of this nature. As regards pole line construction, where will we begin? I would suggest with the pole. We experienced little or no trouble in getting good, dry, live cedar poles, that are graded to a standard set up by the pole dealers.

The pole should be well peeled, dressed up, housed and gained. One, two or even more extra gains should be cut while the pole is down, as it is much easier and more cheaply done on the ground. We will not go into details of setting poles, in this paper, but suffice it to say that a pole well set and tamped is half guyed. No matter how good your poles may be or how straight the line is in which they are set, if they are not properly guyed, you will have a poor piece of work on your hands when through. It is safe to say that a properly guyed pole line will enhance its value fully fifty per cent.

I do not advocate the use of the so-called hand-made guys, as, to make a stranded guy is a difficult task for men to perform and get each strand of equal tension. Machine twisted guys are cheaper, stronger, and more easily handled. Guy clamps should be used in all cases, as it permits of coming up with the end and taking the slack out of a guy, if necessary, without cutting it. Guy rods are better than ungainly looking posts and should be used wherever possible. All guy wires should be fitted with circuit breakers, placed at a distance of 6 to 8 feet from the pole end to prevent accidents and grounding from live guy

wires. Guying to trees, buildings, etc., should be avoided entirely as other people's property is not yours and you cannot make it so by making fast to it in this manner.

In the construction of the ordinary plant the subject of guying is an after consideration and if a guy is put up one end is made fast to the pole and the other to some man's house, barn or tree. This is bad practice, even if the permission of the owner is granted, as the ownership of these buildings may be changed at any time. Special attention should be paid to all corner, junction and end poles or there will be no end of trouble when you commence to pull up your wire.

In digging holes it is immaterial whether you commence at the top and work down or at the bottom and work up. To dig the hole in the shortest possible time is the object in view and the nature of soil will always dictate the mode of procedure and tools to be used. The important part of the hole is the filling of it. Dry, loose dirt and rock, well, exceedingly well, tamped, will always hold a pole in place.

Cross arms are made in standard sizes and spacings of not less than 18 inch centers and 17 inches between pins, should be used on all lines carrying a thousand or two thousand volts. Cross arms should be doubled on all corner, junction or end poles. On 6 and 8 pin arms 9-16x9 inch lag screws should be used and not less than 1x14x26-inch cross-arm braces. Some superintendents insist upon having galvanized iron throughout; this is undoubtedly all right, but it is not absolutely necessary in all cases. It depends upon the color the poles are painted. Cross arm braces should be used on all cross arms over three feet long and I would recommend their use on two pin arms if a heavy wire is carried upon them.

Good live oak pins are all right to use on straight runs or light wires, but on corner or junction poles locust pins should be used. On wires from eight to four naught it would be better construction to use iron pins to support the heavy strains put upon them.

The height of poles is a matter that should receive considerable attention. The matter of trimming trees has caused a great amount of trouble and annoyance to both property owners and station managers. We, who are engaged in the business, can see little or no reason why a person should protest at having their trees trimmed to allow the stringing of wires, without coming in contact with the limbs, but how would it be if we owned the trees and were interested in the building of other people's property? Undoubtedly we would object to having our trees trimmed or poles set in front of our premises, as much as they. In order to avoid trouble of this nature I would recommend the erection of poles high enough to bring the bottom wires well above the trees. This would, in a measure, remove the necessity of cutting trees and would at the same time insure a clear line free from grounds caused by wires cutting into the limbs which are left in the way.

Recent orders received by our local company in Madison compelled them to remove all poles and wires from the four streets bounding the Capitol Square. In order to do this the streets one block from the square were used for the new pole line. The trees on these streets were numerous and extremely large and tall and in order to get above them it became necessary to purchase unusually tall poles. Consequently poles were brought from Idaho, ranging from

*Paper read before the Northwestern Electrical Association Convention, held at Milwaukee, Wis., Jan. 16-18, 1901.

55 feet to 75 feet long with 7-inch to 10-inch tops. These poles are very straight and when painted make a pole line that is worth going to see and will undoubtedly stand the aging tests for years to come. Of course these poles cost money; it also costs money to trim trees and to keep them trimmed, so it is possible that in the end the long poles will cost no more than the shorter ones and when it becomes necessary to string an extra circuit your men will not have their attention diverted from their work by a man or woman with a shot-gun.

Stringing wires over buildings is bad practice, as you are liable to damage the roofs over which they pass. For instance, it is customary to build a horse to support a circuit which will be placed upon the roof and in time the water collects and rusts the tin under the legs. Leaks result and water causes damage to building and merchandise and the owner brings suit. This would not happen if all wires are carried on poles owned by the company. A few weeks ago the writer had occasion to visit the roofs of some of our stores and the sight was amazing. Some of the roofs were crossed and re-crossed by a score or more of telephone wires. On account of the electric light circuit being entirely new in the district visited its wires were found to be in excellent condition. The poles being tall and new made it a good substantial piece of property. However, in some instances, service wires are run too low and would thus interfere with the firemen in discharge of their duty. Of course these wires will have to be removed and this will cost money. When a service wire is to be run it would be well for the superintendent to visit the building and determine where and how it should be strung and thus be sure that it would not have to be removed on account of misjudgment.

Cross arming poles is a very particular part of the construction of a good pole line. Great care should be taken to see that the gains are not cut too large in the poles, thus allowing the cross arm to wobble. The lag screws should not be driven in only enough to give it a start but turned in the remainder of the way. Cross arms should be put on the side of the pole opposite the strain so that it will not be pulled off. In double cross arming, holes should be bored through the spacing blocks which should not vary in length from the thickness of the pole at the gain, so as to prevent bending the cross arm.

Arc lamp poles should be 40 feet long and at least 7 inch tops. These should be set with a 6 foot plank running edgewise under the top of the ground just far enough to be covered and square with the face of the pole, looking to the center of the square. This plank will greatly strengthen the pole and prevent its top coming over by the constant strain of the arc lamp. When an order is given to put up an arc lamp in the outlying districts it is customary to rush the work and get the lamp to burning. The quicker it burns the sooner it becomes a revenue. But how about the rush work. After the work is done it is found that the poles were not set in proper position. They are in or out of the proper line. It may not happen at the time the line is built, but a year or so afterward when it is brought to your attention by the mayor or aldermen.

It will then be found necessary to do a part of the work over again, which proves the old adage, that "Haste makes waste." In order to avoid this transplanting process, I would

suggest that the proper authority, the city engineer, for instance, be made to stake out where poles could be properly set. It is reasonable to infer that if a city gives a company a franchise to use its streets to set poles in, that it will furnish some one clothed with authority to designate the proper location for them, or at least define curb lines, corners, gutters, etc. It is also better in laying out new lines to run them with a view to getting future business and not always by the shortest and quickest route. Often it is possible to run into a neighborhood that will give you a few customers that you were not anticipating. An electric line running past a man's house sets him thinking when nothing else would. We have been able to secure business after the line was up from parties who were not anxious for the light but could not offer the absence of a pole line as an excuse for not wanting it. Whenever possible it is undoubtedly best to set poles on lot lines or run in alleys and feed to the rear of the stores and houses. The neatest service wires you can put up do not improve the looks of a good piece of architecture and a bad looking pole line makes a bad looking street. To much construction work is done simply for the time being and not with the demands of the future in view.

ELECTRIC ILLUMINATION.

[The following is a synopsis of a lecture delivered by Dr. Louis Bell on "Electrical Illumination at the Beginning of the Twentieth Century," at the station of the New York Gas, Electric Light, Heat and Power Company, Duane street, New York City, before the New York Electrical Society, on Wednesday, January 30, 1901.—ED.]

President T. C. Martin, of the New York Electrical Society, called the meeting to order, and introduced Mr. John W. Lieb, Jr. who, on behalf of the New York Gas and Electric Light, Heat and Power Company, bade the guests welcome, and introduced Dr. Louis Bell.

Dr. Bell.—Mr. President, ladies and gentlemen: It gives me great pleasure to be able to deliver the first address of the new century to a body which has done so much to cultivate and stimulate, interest in the electrical arts as the New York Electrical Society. It is particularly happy, perhaps, to speak of electric lighting in this place, which is, as one may say, the head center of lighting from the old times, and, moreover, the beginning of the twentieth century is a particularly fitting time, except for the prophet, to speak of electrical lighting, because it is to be hoped that during the current century we may have tremendous changes in the art, and when the twenty-first century dawns some of the things which I show you here to-night will have passed out of use and the rest be very much improved. We are proud of the progress which electric lighting has made, but cannot afford to shut our eyes to the beneficent changes that may come over the art.

I am going to try to speak to you to-night, not of the science of electric lighting, but rather of the art of electric illumination. The art has been as much neglected, perhaps, as the science has been cultivated. I do not propose to waste any time in explaining the doctrine of the electric current. I do not know very much about it, and I think my audience

knows practically what I do. I am going to take the current for granted, and take the appliances which we have for granted, and try to briefly explain what we can do with them, in the way of getting illumination which is, after all, the object for which the whole science of electric lighting has been developed.

To begin with, I find that there is generally a good deal of misconception as to what we want by artificial illumination. There are two radically different doctrines, one may say, although they have not been formulated as doctrines, with regard to electric lighting and to artificial illumination of all sorts. One is that when we do artificial lighting we must try to vie with nature herself, beat old Sol at his own game. The other recognizes some of the limitations which finite intelligence and finite resources have imposed upon us, and goes at the subject of illumination, not as rivaling the illuminants of nature, but merely as furnishing such amount of light as we actually need for some useful purpose.

At the present time I think it is safe to say that more illumination fails from being too bright than from not being bright enough. By too bright, I mean too intense, as I shall presently show. The eye is a very curious optical instrument. Von Helmholtz used to say it was one of the worst optical instruments with which he was acquainted; that if an instrument maker had sent him such an instrument so badly constructed with reference to all scientific principles as the human eye, he would send it back, with thanks. Nevertheless, it has one peculiarity, one power, which is the basis of all our attempts at artificial illumination, which makes it possible, practically, to get artificial illumination, and that is the human eye can work over a tremendous range of brightness and still do its work effectively. We can read in brilliant sunlight, or by the light of a single candle, with fair comfort in both cases, although the candle is nearer than the sunlight. It makes comparatively little difference whether we read by the light of one of these arc lights, or a single candle, so far as comfort goes. For other purposes the arc light is very valuable, but the eye itself gets along very comfortably even when the amount of light is considerably reduced. That comes from the expansibility of the iris of the eye, widening or narrowing the pupil, in accordance with the demands of the occasion.

Whatever the source of illumination, there are some fundamental principles we must not forget in trying to do artificial lighting. I think the first is that the source of lighting ought to be unobtrusive, and if you stop to think of it, that is the direction in which most artificial lighting errs. Instead of the source being unobtrusive, it is obtrusive, even unpleasantly so, and instead of helping the vision often hinders it, for the reason that a bright point of light in the field of vision causes the pupil to shut up and protect itself and lessens the amount of light entering the eye, so that one cannot see with anything like the convenience which the amount of light would indicate. Excessive brightness of a particular spot is a thing to be avoided in all illumination. That is the reason for globes enclosing the lamps. The eye sets itself as regards the width of the pupil, as regards the effective aperture through which light falls on the retina, approximately to suit the brightest point in the field of vision, and as a result of

that a very bright light dazzles the eye, and makes it extremely difficult to see objects which are not given bright illumination and causes trouble.

The intrinsic brilliancy of the arc light is the highest artificial brilliancy with which we have to deal. We have all the way from 20,000 or 30,000 to 50,000 candle power per square inch in some portions of a very bright arc. Some estimates have run as high as 100,000 candle power per square inch of radiant surface. The calcium light, with which we are familiar as a bright illuminant, has only 5,000 candle power to the square inch, while the ordinary incandescent light has only a matter of about 200 candle power to the square inch. And even that is too bright. If you will look at it intently for a moment, you will see, when it is out, that you will catch an after-image in the eye of that bright filament. The after-image is a symptom of what may be serious effects on the eye if long continued. As a result, one can safely say that even the ordinary incandescent lamp, valuable as it is as an illuminant, is intrinsically too bright to yield entirely satisfactory results.

Another fundamental point in illumination, which is sometimes forgotten, and which is really important, is its direction. One would suppose at first that it would not make any particular difference what way light fell upon an object which is to be illuminated, whether you obtained it horizontally from the side, from below or from above, yet, in point of fact, it has been found by long experience that light from above is much more useful than light from the side, or, particularly, from below. I suppose this is due to the fact that the eye through the many centuries of its development in man has become habituated to getting sunlight from above rather than light from below. It is a well established fact that light which comes from an abnormal direction into the eye is sure to produce fatigue in one way or the other. For example, light reflected from snow is peculiarly severe and often produces a species of inflammation resulting in snow blindness.

The foregoing leads me to mention the value of diffused lighting. Anything like diffusion of light means there will not be any one particular point which is very brilliant. The brilliancy will be rather moderate. At the same time an enormous amount of light can be successfully diffused in practice, and on diffusion we depend for some of the most valuable results in illumination. You can easily get an idea of the amount of the diffused light in a room by a simple experiment, that is, by turning out the lights which are available and then shielding yourself from the only source of light which you have left, and you will find in spite of being in the shadow considerable light will still be manifest all about you. The amount of light which can be diffused in that way is large indeed, large enough to be a perceptible factor in all our attempts at illumination. In fact, a room with white walls will give two or three times the effective illumination, with the same radiant, as a room which is painted in dark colors. A white painted surface is the very best diffuser of light. A white surface will diffuse from 60 to 80 per cent. of the light which falls upon it. The light shades, of yellow almost as much. The distinctly yellow shades are admirable for diffusing light. Then come the shades of red and orange of various kinds. Then come the light blues, and last of all the very deep blues and the

greens. A dark green is perhaps the worst diffusing surface that can possibly be found. A room as light in color as this can be successfully lighted by diffusion alone, where there is no direct radiation falling upon the eye at all. Sometimes it is a very excellent scheme to avoid too brilliant radiance, also to get a correct direction for the illumination, by depending entirely upon diffusion. Diffused light is apparently not as efficient as the brilliant light you get from an unshaded arc. It takes, undoubtedly, a great deal more of energy to give an equal amount of light in candle power, at the same time it is a question whether lights supplied in that way consume the same amount of energy as a single arc light would to give the same illumination in the room. I think it is safe to say that the diffused light will give a much better illumination in spite of its lessened gross amount, on account of the fact that the light comes from the direction which is most useful, and is faintly tinged to a pleasant color by the slight tinging of the ceiling, and that brings me to the rather important matter of color.

Color is a matter of great importance to illumination, for two reasons and in two particular ways. In the first place, the color of the light which we are wont to receive is not white; it averages a rather yellowish white. We sometimes think it necessary to obtain extreme whiteness of illumination. You received it from that lamp a moment ago—it did not look white, but unpleasantly dazzling. An illumination of normal color, that is to say, a somewhat yellowish white, is the one to which we are all used, and by which we are wonted to judge the colors of objects above us. Deep colors are always unpleasant and entirely unsuited to any practical illumination: even a very much modified shade is not altogether pleasant. It is a sort of bluish, moonlight color. In general, it is safe to say you cannot fool with the color of your illuminant without producing disagreeable results: it makes no difference what the exact shades are. It is very desirable to confine oneself in the use of colors in illuminants, to colors to which one has become habituated—that is white or yellowish white.

Practically all our sources of light at the present are incandescent solids, of one sort or another. The flame is merely the aggregation of white hot, yellow hot or red hot particles of carbon. The incandescent filament from one of these lamps is merely a filament of carbon heated red hot, or white hot, as the case may be by the current. In the case of the arc lamp we have the same thing, the radiant point there being the crater of the arc at the ends of the carbon, which are heated to a very high temperature, indeed, and are brilliantly radiant. It should be borne in mind that the temperature of the flame, or the temperature of the radiant matter, is the thing which largely determines its color. A piece of iron heated moderately is red hot. After a bit it gets nearly white hot, and yellow hot, and finally it comes to a dazzling brightness, or whiteness. The same is true of any incandescent solid. We find certain oil lamps give a distinctly orange tinge; we find candles giving a pronounced yellowish tinge, with much red, and the gas lamps give a yellowish hue, with less red, finally the incandescent lamps when they are thoroughly energized by the current and heated extremely hot give a light which is almost pure white, as white as the arc, and the

arc lamp, which has a higher temperature than all the others gives a light which is distinctly white or bluish white. It should be borne in mind that in incandescent lamps the question of color has nothing to do with the amount of light: simply the temperature of the filament which gives the light.

For the purpose of obviating the extreme brilliancy which we get from the unshielded light the best general expedient is the frosted globe. There are many others which can be used successfully. There are various ways of lessening the extreme brilliancy of incandescent lamps, besides the use of the frosted globe. For example, we have lamps which can be toned down very materially by the use of shades, which produce in no very striking way the same softening of the light which you get from the use of the frosted bulb.

The incandescent lamp, in spite of its usefulness in a general way, from a scientific point of view is unsatisfactory. You cannot get a high enough temperature in the filament, which will stand up any length of time, and get the efficiency you want to get. Of the total energy which goes into a lamp like that before you (and it is a pretty efficient lamp, happens to be a 2-watt lamp), only about 5 to 6 per cent. is returned to you as light. The rest of it goes into heat. The amount of heat radiated, in spite of the fact that the incandescent lamp is, of all the ordinary illuminants the one that gives the least heat, amounts to 94 per cent., or thereabouts, of the total energy supplied to the lamp. The low efficiency is due purely to the fact that we cannot carry the filament at a temperature high enough to get the desired increase in efficiency. For the purpose of improving the efficiency, there have been conducted experiments innumerable, but the best product of to-day are lamps running at 3 watts per candle, or a little under, but they still have an efficiency of only between 5 and 6 per cent. For better results than that we have to turn to other sources of illumination and the obvious thing to do is to carry up the temperature of the illuminant to a point far beyond that which is found in the incandescent lamp. That is done in the arc lamp. At the temperature of the arc the carbon is vaporized very rapidly. Carbon, such as you find in the arc lamps, and in the filaments of incandescent lamps, is a substance somewhat volatile. It volatilizes somewhat like iodine, passing from solid into the form of vapor and softens and gets putty-like, so when the incandescent lamps are carried to a high temperature the filament softens and rapidly breaks. As a result we have to look to the arc for help.

There is a difference, even in arcs, in point of brilliancy, and there again, just as in the incandescent lamp, it resolves itself into a question of temperature. The bigger the arc is, the larger the volume of current and the hotter the arc gets, the more efficient it becomes. Some of the earlier lamps, which carried a heavy current and gave a very short arc, were tremendously brilliant and very efficient. Here is a lamp, with a short, flat arc, taking a heavy current and is enormously efficient. It has perhaps 35 per cent. more efficiency in producing light than these small arcs, because the carbon is carried at a much higher temperature. It is, however, an arc which is not now a favorite by reason of its unsteadiness and hissing and sputtering. We have passed now almost entirely to the enclosed arcs. The enclosed arc is simply an arc with an air-tight

globe around the carbon, the air-tight globe having a sleeve at the top into which the carbon fits nicely, so that the air has the oxygen burned out of it, the carbon burns in an atmosphere which does not oxidize as rapidly, and consequently gives a better light. The enclosed arcs generally have around them a second globe. In this case the arc has around it a very large sample of these holophane globes, which gives an admirable distribution of light, and softens it in a way highly satisfactory, without at the same time cutting off any considerable amount of the light.

The alternating arc is another example of the way in which the temperature of the heated body affects its efficiency. You have there the first type of alternating arc brought out—the Jablochkoff candle—which was used years ago for illumination in Paris. I fancy it is the first time one has been seen in this city for many years as they have passed out of use. The light there is curious in color, because between the two carbon elements conveying the current there is a thin strip of kaolin which becomes very hot, and the kaolin gives out, like the lime light, a considerable amount of light on its own hook. In fact, the principle of the Jablochkoff candle, with its bridge of kaolin between the light and the carbon, is quite similar to the principle of the Nernst lamp which has recently been brought out. In that case there is conduction across a stick of substance, which is normally a non-conductor. In this case there is a kaolin strip which passes between the two carbons. The lamp had, from the earliest times, the same unpleasant habit, you have seen illustrated, of going out on small provocation; and as the lamps are practically put out they had several carbons with a very ingenious way of shifting the current from one to the other, in case one came to grief.

After all, you will say that the efficiency of even our best illuminants is not very high. The efficiency is not anything like what we would have it. It is not a very comforting thing to think of putting in 100 horse power of energy, and getting out 5 horse power in this form, the form in which you want to use it. It is not consoling to think of utilizing any arc lamp, and getting out, if you have good luck and use a first-rate lamp, 10 per cent. of the energy you put in.

There is a determined effort going on to better the efficiency of the incandescent lamp, but the result is not by any means certain. It is certain, however, that a lamp has been produced which does give an efficiency as high, or higher, than can be obtained by any incandescent lamp, and approximating that which can be obtained by the smaller light of the electric arc, and that is one very encouraging direction for experiment. I imagine that in six months or a year the Nernst lamp will become perhaps not a common sight, but a lamp which will be found more readily than I could find one at this time for the purposes of this lecture. An interesting line of operation is that which depends on the dropping of incandescent solids and passing to incandescent gas. The phenomenon on which experiments of this kind are based is that of the passage of electricity through rarefied gas, such as is seen in the ordinary Geissler tubes, as exhibited. I had hoped up to the last minute I should have a Geissler tube lamp here, but, like the Nernst lamp, it is not quite ready to materialize. There is every reason to believe it is possible to extract from incandescent gas

perhaps as high as 25 or 30 per cent. energy put in it in the form of light. Nevertheless, the difficulties in the way are many. We have available very good incandescent lamps, very good arc lamps, and we have an enthusiastic hope of getting something along the line of the Nernst filament, which may be useful. We have an earnest wish that we may perhaps discover in the use of incandescent gas a higher efficiency than we can get from solid incandescence, and we have an illusory sort of an idea, if fortune favors, we may discover the secret of the glow-worm, but of that the glow-worm himself will have to speak. Science does not know his mind in that regard. So we can say, in summing up the progress, at present we have a very useful means of illumination, but we have not, by any means, yet reached the point where we can look pleasantly on our artificial illumination and say we have anywhere nearly what we want.

How to Get on in the World.

To shirk a disagreeable task that has to be done, with good will or without; to try to evade the inevitable and postpone necessity: to stand shivering on the brink when the plunge must perforce be made, and the sooner it is made the sooner the shock and its consequences will be over; to waste our strength in fretful anticipations of fatigue, and to substitute dilettanteism for honest work, perfunctoriness for brave endeavor—these ways of living, though too much after the manner of half-hearted men, are the ways which lead to ruin and destruction. It would seem, indeed, as if the chief good of life consists in the steadfastness with which one can buckle to and bear one's burden—buckle to and bear one's load: as if tightening the straps and strengthening the harness itself lessens the strain, and the more closely one stands up to one's work the easier it is to do. Putting off the day of buckling to, hoping for miracles to be wrought in our favor by which that day shall never come at all, praying to the friendly Hercules looking down at us from the clouds to lift our cart from the rut and save our own shoulders from the wheel, are mispent hours and misdirected energies in every way. It would be more to the purpose to buckle to with a will, and lift that sticking cart by one's own efforts. It can be done, and more—it has to be done; and delay scores nothing to our advantage, but much to our disaster, for sticking carts have the faculty of sinking deeper the longer they stand, and difficulties accumulate by time and delay, till what was once a layer of fine white sand, and which a feather could brush away, becomes by neglect and lapse of moments a hard and concrete stratum, which not even the unassisted efforts of Hercules himself could break up or remove. Take the case of a man whose affairs are going wrong, and whose books show a perilous inclination. Obviously the only rational thing for him to do is to buckle to at once, go into his affairs, check his expenditure, cut off his superfluities, and lift his cart from the rut of bankruptcy into which it is fast sinking. But if he has not the energy or common sense necessary for this—if he delays for this hope, for that fear—if now this problematical gain is to be made, that bad debt paid up—if his wife's delicate nerves need management, and the state of her health demand a carriage—if he must strain one point for his son on his en-

tering into life, and another for his daughter on her first season—if shadowy fingers slacken the straps, and the mildew of fallacious hope rusts the buckles—what can there be but irremediable disaster and a general collapse as the result of those insane attempts to shirk a painful task and evade the inevitable? If he had had the courage of his situation, and buckled to at the first, he might have retrieved all that had been lost, and made good his future position. It was simply a question of promptness and daring—of buckling to with a will. But he temporized and delayed, slackened this girth, loosened that strap, let ends fly loose and buckles slip, hoping rather than doing, and looking to that stalwart Hercules in the clouds or on that machine where he thought was hidden the god who would put all things right with a nod of his head, rather than trust to himself, putting his own shoulder to the wheel and buckling to like a Trojan. In consequence when he comes to grief, anyone but himself could see he was foredoomed, and upsets the whole concern into the ditch. This is one result of that foolish temper which will not accept cheerfully what it cannot avoid by any ingenuity in the world, and which does not reflect that the more closely-fitting the harness the easier it is to draw the load. If grumbling at a trouble would lessen and finally disperse it altogether, by all means let it be done; if shifting one's yoke from shoulder to shoulder, and vainly trying to pull it over one's poor long ears, would slacken the strain and finally dissolve the substance, one would be well quit of one's impediment for a little abrasion of the epidermis; but when it only chafes and does not slacken, only deepens the sore, and never dissolves the substance, it seems but a poor exercise of energy and ingenuity, and buckling to would be a better employment for all.—“Calvert's Mechanics' Almanack.”

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended January 30:

Antwerp, 47 packages, \$2,197; Argentine Republic, 101 packages, \$3,958; Australia, 1 case, \$22; Barcelona, 1 package, \$14; Bilbao, 2 cases, \$292; Brazil, 37 packages, \$2,812; British Guiana, 23 cases, \$467; British East Indies, 4 packages, \$188; British Possessions in Africa, 163 packages, \$9,032; British West Indies, 9 packages, \$215; Central America, 41 cases, \$2,120; China, 30 packages, \$870; Chili, 6 packages, \$218; Cuba, 111 cases, \$7,090; Ecuador, 12 cases, \$170; Genoa, 57 boxes electrical railroad material, \$1,815; 168 packages, \$43,076; Glasgow, 9 cases, \$420; 383 packages, \$47,102; Hamburg, 15 packages, \$3,884; Havre, 7 cases, \$198; 11 packages, \$1,201; Hayti, 2 cases, \$22; Hull, 29 packages, \$3,893; Grenoble, 1 case, \$130; Hong Kong, 30 cases, \$2,614; Japan, 152 packages, \$31,749; Leicester, 1 case, \$75; Liverpool, 217 packages, \$4,923; London, 513 packages, \$23,931; Manchester, 76 packages, \$18,400; Marseilles, 49 cases, \$744; Mexico, 112 packages, \$6,827; Milan, 27 cases, \$1,135; Naples, 10 cases, \$2,381; Newcastle, 4 cases, \$200; Nice, 4 cases, \$520; Peru, 60 cases, \$2,226; Sheffield, 3 packages, \$107; Siam, 2 cases, \$143; Southampton, 17 packages, \$289; St. Petersburg, 4 packages, \$510; U. S. Colombia, 9 cases, \$2,272; 23 packages, \$940; Uruguay, 3 packages, \$150; Venezuela, 28 packages, \$148.

PERSONAL MENTION.

Mr. J. M. McGrew, manager of the Kaster Electric Manufacturing Company of Chicago, died at his home last week. Death was due to Bright's disease.

Hon. Allan L. McDermott of Jersey City was recently elected president of the Washington Traction & Electric Company, which comprises eleven of the twelve street car lines and both the electric lighting companies of Washington, D. C.

Mr. S. D. Sprong has been appointed chief electrical engineer of the Central Electric Company, with headquarters at Metuchen, N. J.

Mr. E. H. Barnes of New Haven, Conn., has been elected a director of the Boston Electric Light Company and **Mr. Sidney Hosmer** was appointed general manager.

Mr. E. T. Holmes was lately elected president of the Holmes Electric Protective Company of this city, to succeed his father, the late Edwin Holmes.

INCORPORATIONS.

The Advance Electric Company, Indianapolis, Ind. Capital stock, \$5,000.

The Louisville Anchorage & Pewee Valley Electric Railway Company, Louisville, Ky. Capital stock, \$750,000.

The Auto-Dynamo Car Company, New York City—to manufacture electrical machinery. Capital stock, \$200,000.

The Leadville Electric Power Company, Denver, Col. Capital stock, \$3,000,000. Directors: E. S. Douglas, L. R. Tatum and George C. Manly.

The Indianapolis Electric Plating Company, Indianapolis, Ind. Capital stock, \$2,000. Directors: Benjamin Aufderheide, Fritz Boller and others.

The Elkhart Electric Company, Indianapolis, Ind. Capital stock, \$100,000. Incorporators: Martin V. Berger, Charles H. Tenney, J. S. Dodge, Charles Hewitt and James Dushane.

The Electrical Engineering & Developing Company, New York City. Capital stock, \$10,000. Directors: H. S. Cooper, Ithaca; W. S. Gurnsey, El, New York City, and B. Y. Frost, Nyack.

The Evansville Electric Railway Company, Evansville, Ind. Capital stock, \$50,000. Directors: J. E. Bowles, C. A. W. Dodge, J. C. Parker, Sebastian Henrich and Alexander Gilchrist.

The Electro-Chemical Extraction Company, Berwick, Me.—to do a mining business. Capital stock, \$300,000. Officers: President, Edward F. Gowell of Berwick; treasurer, Harold V. Noyes of Berwick.

The Curtiss Construction Company, Cleveland, O.—to make a specialty of equipping electric and steam railways. Capital stock, \$10,000. Incorporators: E. J. Kennedy, James R. Curtiss, J. C. Gallup, Jay E. Latimer and Aaron Black.

A Good Book on Copper.

We are in receipt of "The Copper Handbook," by Horace J. Stevens of Houghton, Mich. This work, which contains some 350 pages of matter, deals with the copper industry throughout Michigan and will be found invaluable to copper investors. In the opening pages the early history of the discovery of copper in the Lake Superior districts is touched upon, after which such invaluable information as the detailed descriptions of all Lake Superior copper mines appears. This work might aptly be termed the "Copper Investor's Guide," as without exception it furnishes in a convenient and condensed form the most valuable information for copper investors that has yet come under our notice. The price of this work is \$1 bound in paper or \$1.50 in cloth. It is the author's intention to keep the book thoroughly up-to-date by issuing a revised edition every year.

Death of Mrs. Ralph W. Pope.

Mrs. Ruth Emma Whiting Pope, wife of Ralph W. Pope, secretary of the American Institute of Electrical Engineers, died January 26 at her home, 570 Cherry street, Elizabeth, N. J., after an illness of nearly two months.

COMMERCIAL PARAGRAPH.

A pamphlet is just issued by J. S. Bache & Co., 66 Exchange Place, New York, entitled "American Industrials, with Special Reference to the Preferred Shares as Investments." It contains descriptions of the organization, financial condition and other salient facts of thirty industrial securities. The object is to show that there are a number of industrial stocks which may be considered safe from the purely investment basis. Not the least important feature of the publication is the digest of New Jersey laws, where the protection afforded to preferred shareholders under the general laws of the State of New Jersey are pointed out and the special conditions which differ therefrom in the case of individual companies. The specific information considered includes the organization, payment of dividends since consolidation, officers and directors, financial statement, balance sheet, president's report, bond investment account, constituent companies, annual output of the subsidiary companies before consolidation and since, character of product, range of stock quotations, underwriters' profits, preferred stock powers, charter requirements, character of control and investment advantages of the preferred shares.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED JANUARY 29, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

- 666,660. Lubricating Trolley-Wheel. Alfred W. Gabrio, Hazleton, Pa., assignor of one-half to Josiah T. Berryman, same place. Filed June 12, 1900.
- 666,736. Fender for Street Cars. Luther Case and Henry J. Schultdt, St. Paul, Minn., assignors to Phillip W. Herzog, same place. Filed Feb. 26, 1900.
- 666,900. Automotor-Trolley for Electric Currents. Louis Lombard-Gerin, Lyons, France. Filed Nov. 10, 1900.
- 666,964. Car-Fender. Franklin P. Laws, St. Louis, Mo., assignor of one-half to Frank H. Houghton, same place. Filed Oct. 15, 1900.
- 667,079. Traveling Contact for Underground Electric Railways. John Floyd, Washington, D. C. Filed April 27, 1900.
- 667,110. Electric Railway. Granville T. Woods, New York City assignor to the General Electric Company of New York. Filed Sept. 29, 1897. Renewed Oct. 15, 1898.
- 667,133. Pneumatically-Controlled Trolley. John B. Linn, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Nov. 13, 1899.

ELECTRIC LIGHTS AND APPLIANCES.

- 667,106-667,107. Electric-Arc Lamp. Elihu Thomson, Swampscott, and Charles E. Harthan, Lynn, Mass., assignors to the General Electric Company of New York. Filed Oct. 19, 1897, Nov. 4, 1897.
- 667,119-667,120 667,121-667,122. Electric-Arc Lamp. Richard Fleming, Lynn, Mass., assignor to the General Electric Company of New York. Filed Aug. 29, 1898, Nov. 9, 1898, March 2, 1899, Nov. 12, 1900.
- 667,123-667,129. Electric-Arc Lamp. Charles E. Harthan, Lynn, Mass., assignor to the General Electric Company of New York. Filed July 27, 1898, Oct. 2, 1899.

ELECTRICAL MACHINERY AND APPARATUS.

- 666,655. Electric-Motor Controller-Frame and Method of Constructing Same. Thomas W. Eaton, Chicago, Ill., assignor to the Eaton & Prince Company, same place. Filed Oct. 8, 1900.
- 666,656. Mounting for Electric Motors. Thomas W. Eaton, Chicago, Ill., assignor to the Eaton & Prince Company, same place. Filed Oct. 8, 1900.
- 666,691. Electric Motor. Oscar H. Pieper and Alphonse F. Pieper, Rochester, N. Y. Filed Feb. 2, 1900. Renewed Dec. 18, 1900.
- 666,764. Electric-Circuit Controller. Nils O. Lindstrom and Allan Cowperthwait, New York City, assignors to Alonzo B. See and Walter L. Tyler, same place. Filed July 6, 1900.
- 666,831. Device for Indicating Disarrangement of Armatures of Electric Motors or Generators. Joseph T. Watson, Philadelphia, Pa., assignor of one fourth to Jacob E. Fritz, Camden, N. J. Filed Aug. 16, 1900.
- 666,849. Dynamo-Electric Machine. Arthur E. Jenney, Boston, Mass., assignor to the Holtzer-Cabot Electric Company, Brookline, Mass. Filed May 5, 1899.
- 666,920. Automatic Cut-Out Device for Use in Connection With Electrical Generators. Monroe S. Clawson, Weehawken, N. J. Filed May 21, 1900.
- 666,940. Static Electric Machine. Jens Sorensen, Grand Rapids, Mich. Filed Jan 19, 1900.
- 667,054. Prepayment-Meter. Edmund Allo, Lynn, Mass., assignor to the General Electric Company of New York. Filed April 20, 1898.
- 667,066-667,070. Prepayment Electric Meter. Frank P. Cox, Lynn, Mass., assignor to the General Electric Company of New York. Filed Sept. 13, 1897, Oct. 12, 1899.

- 667,067-667,069. Prepayment-Meter. Frank P. Cox, Lynn, Mass., assignor to the General Electric Company of New York. Filed April 14, 1898, Oct. 12, 1899.
- 667,068. Prepayment Mechanism. Frank P. Cox, Lynn, Mass., assignor to the General Electric Company of New York. Filed Oct. 8, 1898.
- 667,030. Coin-Controlled Mechanism. Charles E. Holmes, Lynn, Mass., assignor to the General Electric Company of New York. Filed Jan. 18, 1900.
- 667,095. Electrical Traction on Closed-Conduit Systems. Howard Lane, Birmingham, Eng. Filed Aug. 18, 1900.
- 667,103. Insulator. Howard R. Sargent, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Aug. 31, 1900.
- 667,113. Safety Device for Dynamo-Electric Machines. Harold W. Buck, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed March 11, 1899.
- 667,114. Means for Preventing Hunting of Dynamo-Electric Machines. Harold W. Buck, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed April 28, 1900.
- 667,135. Rheostat. George F. Martin, Corydon, Ind. Filed June 5, 1900.
- 667,138-667,139. Prepayment-Meter. Eustace Oxley, Lynn, Mass., assignor to the General Electric Company of New York. Filed Oct. 28, 1899, March 14, 1900. Renewed Oct. 18, 1900.
- 667,144. Static Electric Machine. Charles H. Cook, Indianapolis, Ind., assignor to the Electro-Therapeutic Manufacturing Company, same place. Filed Jan. 2, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

- 666,674. Telephone-Directory Holder. Irving S. Hoffmann, Mansfield, O. Filed Sept. 26, 1900.
- 666,675. Telephone. George L. Hogan, New York City, assignor of one-half to Julian S. Carr, Durham, N. C. Filed March 9, 1900.
- 666,698. Telephone Exchange Circuit and Signaling Apparatus. Malcolm C. Rorty, Dedham, Mass., assignor to the American Bell Telephone Company, Boston, Mass. Filed Oct. 4, 1900.
- 666,706. Selective Signaling and Registering Apparatus Circuit. Herbert E. Shreeve, Dedham, Mass., assignor to the American Bell Telephone Company, Boston, Mass. Filed Sept. 18, 1900.
- 666,874. Arrangement of Switching Appliances in Connection With Telephones. Parnell Rabblidge, Sydney, New South Wales. Filed Feb. 26, 1900.
- 666,883. Communicating System. Isidor Kitsee, Philadelphia, Pa., assignor to Charles E. Wilson, same place. Filed Feb. 20, 1896.
- 667,016. Automatic Corrector for Step-by-Step Mechanism. Charles O. Janney, St. Louis, Mo., assignor of one-half to Adolf Wissler, same place. Filed Dec 26, 1899.

MISCELLANEOUS.

- 666,658. Electropneumatic Organ-Action. William B. Fleming, Detroit, Mich. Filed Jan. 15, 1900.
- 666,677. Microphone. Alfred G. Holcombe, Southampton, Mass., administrator of Alfred Goodrich Holcombe, deceased. Filed May 16, 1900.
- 666,699. Electric Elevator. Harold Rowntree, Chicago, Ill. Filed Feb. 17, 1900.
- 666,729. Electric Warp-Stop and Filling-Changing Mechanism for Looms. Horace Wyman, Worcester, Mass., assignor to the Crompton & Knowles Looms Work, same place. Filed March 5, 1900.
- 666,731. Electromedical Eyeglasses. Philbert Balme, Izieux, France. Filed March 26, 1900.
- 666,737. Burglar Alarm System. Clyde Coleman, Chicago, Ill., assignor, by mesne assignments, to George B. French, Boston, Mass., and Frank L. Hall, New York City. Filed May 6, 1899.
- 666,744. Terminal for Electric Conductors. Alvirus L. Ellis, Chicago, Ill. Filed Feb. 12, 1900.
- 666,861. Printing Telegraph Instrument. Louis M. Casella, London, Eng. Filed Oct. 30, 1899.
- 666,912. Ship's Telegraph. Leon S. Thompson, Washington, D. C. Filed May 25, 1899.
- 666,933. Electric Belt. John Moore and James Murray, Providence, R. I., assignors to the Champion Electric Belt Company, same place. Filed June 30, 1900.
- 666,954. Relay. Sidney G. Brown, Bournemouth, Eng. Filed March 15, 1899.
- 666,956. Electric Connecting-Handle for Automobiles. Edward N. Dickerson, Stovall, N. C. Filed Nov. 5, 1900.
- 666,958. Selective Signaling. Frank C. Ewing, Acadia, Va. Filed Feb. 8, 1900.
- 667,028. Electric Meter. Alexander D. Lunt, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Oct. 31, 1900.
- 667,115. Burglar Alarm System. Clyde Coleman, Chicago, Ill., assignor to the Bankers' Electric Protective Company, same place. Filed July 12, 1898.
- 667,123. Electric Protective System. Henry F. Freed, Harrisburg, Pa. Filed Aug. 31, 1900.
- 667,125. Electrical Connector. Henry F. Freed, Harrisburg, Pa. Filed Sept. 27, 1900.

THE TELEPHONE WORLD.

Bell Company Instruments.

The American Telephone Company (Bell) makes the following return of instruments placed during the month ended January 20, the first month of the company's current fiscal year:

	1901	1900	Increase.
Gross output.....	66,048	58,853	7,195
Returned.....	25,766	18,966	6,800
Net output.....	40,282	39,887	395
Total outstanding.....	1,993,098	1,620,392	372,706

Fifteen months ago the Syracuse, N. Y., Telephone Company, which had come into possession of the Eugene Hughes subway franchise, began the construction of its subway through the streets of that city. Between that time and this the work of construction of the Syracuse Telephone Company has gone steadily on, involving an expenditure of nearly \$400,000 for the erection of a system, now one of the most elaborate and complete in operation in any American city, and patterned after some of the most perfect systems in the world, those operated by the Government in several of the great European countries. The complete equipment of the exchange, including the apparatus of the wire chief, the toll board, etc., was made at a cost of \$75,000. The type of telephone used by the Syracuse Telephone Company is that of the L. M. Ericsson telephone of Stockholm. The out-of-town service of the company has been extended as far east as Herkimer, a line to Cortland has been begun and will probably be finished by March 1, and connection with Auburn and Oswego is expected in the immediate future. In fact, the management of the new company say it is only a question of time when a complete long distance service will be offered to subscribers.

M. Adrian King, a promoter of independent telephone systems, filed an application with the Los Angeles, Cal., city council a short time ago, in which he asks for a franchise to construct and operate a telephone plant in Los Angeles. Mr. King, who was formerly with the Kinlock Telephone Company of St. Louis, claims that he is seeking a franchise in behalf of himself and a number of Los Angeles men, whose names he would not divulge. He thinks there is a good opportunity for a competing system in that city, especially at the present time. According to Mr. King, his company which is not yet incorporated, proposes to furnish Los Angeles with an improved telephone service at rates much lower than those charged by the Sunset Company. If the new concern gets a franchise and operates a system, it claims that there will be no party lines nor slot machines, but all 'phones will be unlimited. There will be three rates: For business 'phones, \$60 per year; for professional men, \$50 per year, and for residences, \$36 per year.

The Diamond State Telephone Company, with main offices at Dover, Del., and of which H. A. Richardson of that city is president, has purchased of Isaac Robinson, Turner & Son, and F. H. Harper & Son, of Kent County, Md., the telephone line owned and operated by these firms between Hebron station, on the Baltimore & Delaware Bay Railroad, Still Pond and Betterton. This line was built in 1899. The Diamond State Company bought with the assurance that the long distance service will be given to Betterton and Still Pond giving them direct communication with Baltimore, Philadelphia, Wilmington and Washington.

Stephen Engle, of Hazleton, Pa., has invented a telephone transmitter which, it is claimed that experts say, will greatly lessen the cost of equipment of telephone plants. Mr. Engle says that he can make a transmitter that will be no larger than a thimble, and that when manufactured at wholesale they will cost hardly a cent each. The tests which have been made with the new transmitter show that with it only half the number of batteries used now will be needed, while the sound is much more distinct. Over a circuit of 54 miles the tick of a watch was heard as clearly as if it were within a foot of the ear.

The telephone franchise was recently sold at a public auction in Louisville, Ky., by order of the general council. E. M. Coleman was the only bidder. He paid \$10,000 for the franchise, and says he will start an independent company.

The announcement was recently made in Willmar, Minn., that D. N. Tallman, acting for the Minnesota Electric Telephone Company, has purchased the lines and business of the Northern Minnesota Telephone Company.

The Pierce County Telephone Company has made arrangements to put in a local exchange at Spring Valley, Wis., connecting St. Paul and the whole Northwest.

A local telephone line, about six miles long, is being built by settlers in Richmond and Waldron, Ore.

Memphis Company About to Begin Work.

The charter of the Memphis, Tenn., Telephone Company, fixing the capital stock of the company at \$200,000, has been filed in the registrar's office. The incorporators are: William P. Curtis, S. P. Walmsey, William P. Richardson, C. B. Galloway, Jephtha M. Fowkes, Bolton Smith, Thomas R. Reddick, Leon Hunt, James S. Warren and William A. Percy.

The franchise to construct and operate lines in the city was obtained by the company about two years ago, and the charter was offered for registration on August 7, 1899, but the matter was not carried forward at that time, because of the pending action of the city council with reference to an underground conduit system for electrical companies.

J. S. Warren recently said that the company would be organized, and work would be begun at once. "The lines," said he, "will be extended beyond the county, as there are numerous independent companies ready to meet the Memphis Company half way."

William P. Curtis is favorably spoken of for president of the company. The organization of the company will offer competition to the Cumberland Telegraph & Telephone Company of Nashville, which at present controls the entire Memphis 'phone system.

Stockholders of the New York & New Jersey Telephone Company have been notified that an important meeting will be held at the offices of the company, 81 Willoughby street, Brooklyn, on Friday, March 1. The meeting is for the purpose of voting upon a proposition to increase the capital stock of the company from the present amount, \$8,000,000, to \$15,000,000. This will consist of 80,000 shares of the par value of \$100 each, to \$15,000,000, to consist of 150,000 shares of the par value of \$100 each. It is said that the continued increase in the business of the company indicates that expenditures of a considerable amount will be required for the enlargement of the plant during several years to come. Should the increase of capital which the directors have recommended be voted by the stockholders at the meeting on March 1, it is the purpose of the directors to offer the new stock to the present shareholders from time to time in such amounts as may be needed in the construction requirements of the company.

According to a Utica, N. Y., paper, the West Canada Telephone Company has sold its interests to the Remsen & West Canada Creek Telephone Company, and hereafter the telephone service of the district covered by these two companies will be in the hands of the latter named organization. The West Canada Telephone Company was organized October 17, 1900. At that time the engineers engaged on the Trenton Falls construction conceived the idea that a telephone line in that part of the State would be a paying investment and a company was organized, its stockholders being for the most part members of the engineering party. The consideration is not known, but it is stated that it was satisfactory to all parties in the action.

At the recent quarterly meeting of the Tidewater, Va., Telephone Company at Gloucester Courthouse, Mr. Eugene Rhodes was elected manager of the exchange at Saluda, and the lines of Middlesex and Essex Counties. It was decided to rebuild the old Mathews line and open an exchange at Mathews Courthouse, Va., provided \$2,000 worth of stock should be sold at par. It was also decided to build a metallic trunk line from Gloucester Courthouse to Richmond as soon as \$8,000 worth of stock was taken up. The board secured the continued services of Mr. L. C. Catlett as superintendent of this system for the coming year.

Indorsed proposals for an underground telephone cable system will be received at the bureau of yards and docks, Navy Department, Washington, until 1 o'clock, February 16, and then and there publicly opened, for furnishing and installing an underground telephone cable system at the Navy Yard, Washington, D. C. For plans, specifications and forms of proposal address Mordecai T. Endicott, chief of bureau.

The Kenton, O., Telephone Company, which now has over 300 subscribers, held its annual meeting a short time ago. James L. Moore was elected president, J. B. Seymour vice-president and Harlan Park secretary and treasurer. The company proposes to build a number of lines throughout the county, connecting the houses of farmers.

The Harlan County Telephone Company, with a capital stock of \$2,000, is empowered to construct and operate telephone companies in the various counties of the State of Kentucky.

The Mutual Long-Distance Telephone Company has lately finished its new line between Staunton and Harrisonburg, Va.

Free Telephone Service for Huntington, W. Va.

Huntington is one of three cities in the United States where telephone service is had by the public absolutely free of charge. In that town the Bell and a home company are fighting each other tooth and nail, and three years ago the Bell Company created a sensation by announcing that, until further notice, its service would be given all subscribers free.

This was expected to crush the home company, but, contrary to expectations, it has thrived; its rates have not been cut, and its number of telephones has increased. Of course, there has been an active demand for the free Bell telephones, but the home company is owned largely by local residents.

Seattle, Wash., is at present witnessing a lively contest between two sets of capitalists for the privilege of constructing a telephone system in opposition to that now conducted by the Sunset Telephone & Telegraph Company. As the matter now stands two rival companies hold possession of franchises recently granted by the city council, and each declares that it possesses the only valid authority to construct and maintain its system in that city. The last franchise granted was issued to a company of capitalists represented by J. S. McGroarty. Twelve months ago the council issued to the Seattle Automatic Telephone Company a franchise which required that 300 'phones should be installed and in operation within six months. Subsequently the company applied for and obtained an extension of time in which to install the system, and its rival now contends that the extension is invalid. Both concerns aver that they are preparing to install plants costing not less than \$300,000 each and a franchise war, which will require the intervention of the courts to settle is in prospect.

At the annual meeting of the stockholders of the Erie Telegraph & Telephone Company, January 31, in this city, the by-laws were amended changing the date for annual meetings to the Thursday preceding February 1 in each year. It was voted to reduce the board of directors from twenty-five to fifteen. The new board of fifteen was then elected as follows: Edward Abbott, Walter Abbott, A. B. Chandler, Frank A. Cutting, Philip Dexter, William Eddcott, Jr., Frederick A. Farrar, Reginald Foster, Charles J. Glidden, Francis R. Hart, William J. Latta, Frank M. Riter, James J. Storrow, Charles S. Tuckerman and Henry R. Wilson.

The local telephone line owned by Charles Seymour of Knoxville, Tenn., is being re-constructed and complete metallic circuits are being put in instead of single wires. A central office will be located at Benton, Tenn., and a small toll will be charged instead of free use as at present. The line will connect Parksville, Fetzerton, Benton, Wetmore, Coghill and Reliance, all with Madisonville, Tenn.

At a meeting of the directors of the Southern Bell Telephone & Telegraph Company, held in this city last week, W. T. Gentry, of Atlanta, Ga., was appointed general manager of the company, with headquarters at Atlanta. Mr. Gentry succeeded Charles H. Wilson, who resigns to accept the position of general superintendent of the American Telephone & Telegraph Company, with headquarters in this city.

Probably the most complete private telephone system owned and operated by a railroad company is that of the New York, New Haven & Hartford Railroad, by means of which it is possible to transmit orders and communications to the most remote points on the company's lines.

Arrangements are being made to put in another telephone exchange at San Saba, Tex.

It is reported that Hoquiam, Wash., will soon have a night telephone service.

TELEPHONE INCORPORATIONS.

The Ashley Telephone Company, Ashley, O. Capital stock, \$50,000.

The Winona Central Telephone Company, Winona, O. Capital stock, \$10,000.

The A. C. Himebaugh Telephone Company, Burr Oak, Mich. Capital stock, \$5,000.

The Tom A. Marshall Telephone Company, Keithsburg, Ill. Capital stock, \$50,000. Incorporators: Tom A. Marshall, Frederick P. Burgett and David Adelsdorf.

The Zanesville Citizens' Telephone Company, Zanesville, O. Capital stock, \$200,000. Incorporators: Moses M. Granger, Rufus C. Burton, Edward S. Grant, William C. Handley, H. A. Sharp, William D. Schultz and Sherman M. Granger.

GENERAL ELECTRICAL NEWS.

Lighting.

Alden, Ia.—The plan to put in an electric lighting and heating plant here is meeting with favor among the people and arrangements will soon be made to install an electric lighting system.

Canfield, O.—A company has been organized here to erect and operate an electric light plant.

Cleveland, O.—School Director Bell says that electricity is much cheaper than gas, and that electric lights will be placed in all school buildings where artificial light is necessary.

Crayon, O.—F. Long contemplates the erection of an electric light plant here.

Danforth, Me.—There is a rumor that electric lights are to be put in the village next spring.

Dartmouth, N. S.—This town will ask authority from the Provincial Legislature to borrow \$40,000 for the purchase of an electric light plant.

Dresden, Tenn.—A committee has been appointed to investigate the cost of putting in an electric light plant.

East Point, Ga.—This place is figuring on electric lights.

Elberton, Ga.—The citizens of this place are talking of erecting an electric light plant.

Emporia, Va.—A. L. Satterwhite, of this place, invites bids for an electric lighting and heating plant, 140 volt alternating current dynamo, about 500 lights.

Fryeburg, Me.—The proprietors of the chair factory have decided to establish a system of electric lights and it will be generally used throughout the village.

Hartford, Conn.—Senator Brothwell has introduced a resolution instructing the comptroller to procure estimates of the cost of installing an electric lighting plant in the Capitol building, and also an estimate from some electric lighting company or companies of the cost of furnishing electric light for the building.

Jackson, Tenn.—This city will install an electric lighting plant in connection with its waterworks. Plans are being prepared and bids will be received until March 1. Address S. C. Lancaster, city civil engineer.

Lake Providence, La.—Bids will be wanted until February 22 for the erection of an electric light plant.

Mackinac Island, Mich.—The Mackinac Park Commission has given to H. C. Noble, F. C. Andrews and H. Warren, of Detroit, the franchise for the electric lighting and waterworks privilege on Mackinac Island. The cost of the entire improvement will be \$100,000, and work will begin this month.

Newark, N. J.—A contract for the entire illumination of the Pension Building in Washington on the occasion of the inaugural ball was recently awarded to the Electric Motor & Equipment Company of this city.

Newbern, Tenn.—The Newbern Water & Electric Light Plant was lately destroyed by fire. The loss is estimated at \$10,000. A bill is now before the Legislature to authorize the town to issue more bonds to further increase the facilities of the plant.

Norwich, N. Y.—The Norwich Electric Company with a capital of \$100,000, has purchased the lighting plant of Norwich and will furnish the village light in the future. A number of New York capitalists have stock in the new enterprise.

Ravenswood, W. Va.—At a recent election it was voted to issue bonds for putting in an electric light plant.

Roseville, Ill.—There is talk of the Electric Light Company putting in a new and larger set of machinery in the spring.

Sacred Heart Minn.—The citizens of this place are agitating the question of erecting an electric light plant.

Saugerville, Me.—It is currently reported that an electric light plant will soon supersede the present system, which will have capacity sufficient to supply all those who desire good lighting at a moderate cost.

Sayville, N. Y.—At a meeting of the recently organized Sayville Electric Company it was voted to triple the capacity of the plant. New machinery will be installed.

Scotland Neck, N. C.—This place proposes new developments in graded schools, electric lights and water-works.

Scribner, Neb.—The citizens of this place are agitating the question of erecting an electric light plant.

Seattle, Wash.—The Seattle Electric Company makes a cut in cost of lighting, which varies from 10 to 50 per cent.

Street Railways.

Akron, O.—The entire line of the A B C Electric Road between this city and Cleveland will be double tracked next summer.

Atlantic City, N. J.—A syndicate composed of Philadelphia & Atlantic City capitalists has secured control of the Carbon County Electric Railway, operating between Mauch Chunk to Leighton and Weissport, Pa. Over \$1,000,000 will be spent in improving and extending the road, it being the intention to construct a line through to Allentown, a distance of 56 miles.

Buffalo, N. Y.—A trolley road is projected from Toronto to this city, about 150 miles, in connection with the Pan-American Exposition.

Canastota, N. Y.—The proposed electric road from here to Morrisville is practically assured.

Columbus, O.—It is reported that Ohio capitalists have projected an electric railway to traverse the Canadian Province of Alberta, thus providing a short rail and water freight line to the Klondike, and a short rail and water route to the Arctic Ocean. It is proposed to start the road at Edmontown.

Detroit, Mich.—The Detroit & Chicago Traction Company was incorporated last week with an authorized capital of \$4,000,000, and its object is to construct an electric railroad from this city to Chicago, as well as lines in various cities and villages of Michigan and Illinois. P. H. Flynn, W. A. Boland and other New York capitalists are back of the enterprise.

Durand, Mich.—The council recently granted a franchise to W. R. Benson and H. S. Hadsall of Owosso to operate and maintain an electric railway system in this village.

Lansdale, Pa.—The Lansdale & Norristown Electric Railway has been incorporated for \$60,000 to build a trolley line from this place to Norristown. Geo. H. Young is president.

Marinette, Wis.—H. C. Higgins of this city, with his brother Mayor Higgins of Neenah, propose to build an electric line from Mishicot to Green Bay during the summer.

Mullica Hill, N. J.—It is stated that the charter under which the proposed new electric road will be operated, running from Salem to Woodbury, via this place, will admit of the carrying of express matter. Farmers expect to ship milk over the road.

Nashua, N. H.—Hon. Charles S. Collins, of this city, makes an offer that if the New Hampshire Legislature will grant the proposed charter to the company in which he is interested for an electric road between here and Concord, he will build, at his own expense, the proposed State road between the Massachusetts line and the city of Manchester, a distance of 25 miles.

New London, Conn.—A force of men is engaged in surveying for the contemplated electric road between here and Westerly.

Paris, Ill.—Andrew J. Hunter and United States Marshal Hitch are heading a syndicate of Edgar County capitalists to construct an electric line from here to Clinton, Ind., 30 miles long, at a cost of \$250,000. The road is to be in operation next fall.

Rochester, N. H.—There is a move to build an electric railway from Concord to this place via Epsom.

Rochester, N. Y.—The State Railroad Commission will go over the line of the Buffalo, Niagara Falls & Rochester Electric Railway prior to the continuation of the hearing, February 14.

Saco, Me.—The Legislature is to be asked to grant a charter for a twenty mile electric railway between here and Steep Falls.

Somerville, N. J.—A trolley line is projected in Somerset County to run from here to Far Hills, by the way of Pluckemin. It is backed by James Brown, Jr.

Manufacturing.

Chester, O.—A new manufacturing enterprise, capitalized at \$100,000, is being organized here for the purpose of manufacturing porcelain electric light specialties. Among those interested are N. G. Macrum, of East Liverpool; W. B. Hill, Harry Peach, Dr. W. A. Hobbs and S. C. Williams. M. H. Hulings will be general manager of the concern.

Cincinnati, O.—The Bullock Electric Manufacturing Company has secured a \$12,500 contract for several motors from Mr. Crespo, manager of the "El Diario," of Buenos Ayres. This same concern has also secured a contract for the equipment of a generating plant in Tasmania, the value of which will exceed \$11,000.

Memphis, Tenn.—The charter of the Dixie Electro-Magnet Company was recently filed for registration. T. M. Galbreath, B. B. Beecher, Wm. Richardson, Frederick Thelengerder and Walter Goodman are interested in this concern, which will manufacture and sell electric dynamos, motors, engines and electric appliances. The capital stock of the company is \$30,000.

White Plains, N. Y.—The Fleming Motor Vehicle Company was organized lately. The objects are to manufacture and sell engines, stationary or locomotive, for land or marine purposes, and to buy or sell any boats or vehicles to which the same may be attached. The place of business named is the town of Ossining.

Company Matters.

Cleveland, O.—The contract for the signal service system for the fire department was recently awarded to the Gamewell Fire Alarm Telegraph Company.

New York City.—The annual meeting of the stockholders of the Edison Electric Illuminating Company will be held February 12. The transfer books will be closed February 9 to February 13.

Newark, N. J.—A consolidation of electric interests was effected last week at a meeting at the office of L. D. Howard Gilmour, when practically the entire control of the electric lighting-plants in Essex, Union and Morris Counties was centered in the United Electric Company, which was recently organized, with a paid up capital of \$20,000,000.

Niagara Falls, N. Y.—The Taylor Electric Signal Company of Buffalo is considering the question of removing its plant to this city.

Power and Transmission.

Grand Junction, Col.—Hon. Geo. Smith is seeking for capital to erect an immense electric plant at Cameo and to transmit the generated electricity to this place for any purpose desired.

Portland, Ore.—An electric power plant will be built near the Sandy River, at the confluence of the two forks of Gordon Creek, and will have about 25,000 horse power. Back of this enterprise are Hon. H. W. Corbett and associates in the City & Suburban Railway Company.

Automobiles.

Cottage City, Mass.—It has been proposed to buy the franchise and property of the Cottage City Street Railway Company and to operate a line of public automobiles between here and Edgartown. W. M. Butler is interested in the scheme.

Hartford, Conn.—The police commissioners have recently signed a contract with the Electric Vehicle Company for an electric patrol wagon. It is to cost \$3,000 and is to be ready in three months.

Middletown, Conn.—Judge Prentiss recently issued an order in the Superior Court authorizing Frederick A. Betts, receiver of the Keating Bicycle & Automobile Company to continue the business which is located here four months longer, and to borrow not exceeding \$50,000 for that purpose.

Stamford, Conn.—The International Power Vehicle Company, of New York, has leased H. B. Smart's factory building, and will begin there the manufacture of automobiles with a force of 200 men.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

NAME	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.	NAME	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Author'd	Issued.					Author'd	Issued.				
Albany, N. Y.—Feb 4											
United Traction.....	100	\$5,000,000	\$5,000,000	1 1/2 % Q.	169	119	Hartford Conn.—Feb 4				
(Consolidation of the Albany and Troy City Railway.)							Hartford Street Ry. Co.....	100	\$4,000,000	\$300,000	8 % S. Oct.
Allentown Pa.—Feb 4											
Allentown & Lehigh Val. Trac. Co		4,000,000	1,800,000		—	15	Hartford & West Hartford RR.....	100	1,000,000	347,000	—
Bridgeport, Conn.—Feb 4:											
Bridgeport Traction Co.....	100	2,000,000	2,000,000	1 % Aug.	100	—	Holyoke Mass.—Feb				
Baltimore Md.—Feb 4:											
United Rail ways & Elec. Co.....com.	50	34,000,000	18,000,000		16 1/2	16 1/2	Holyoke Street Ry. Co.....	100	600,000	600,000	8 % A., June
Boston, Mass.—Feb 4											
New England Street Ry.....	25	5,000,000	1,081,925	1 % Q., Jan. 15,	—	—	Hoboken N. J.—Feb 4				
North Shore Traction Co.....com.	100	4,000,000	4,000,000		15	16	North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %
North Shore Traction Co.....pfd.	100	2,000,000	2,000,000	6 % S. A. & O.	85	87	Indianapolis, Ind.—Feb 4				
West End Street Ry. Co.....com.	50	10,000,000	4,385,317	8 1/2 % S. Oct., '99.	98	98 1/2	Indianapolis Street Ry.....	—	5,000,000	5,000,000	—
West End Street Ry. Co.....pfd.	50	4,000,000	6,400,000	4 % S. Jan.	112	118	Lancaster, Pa.—Feb 4				
Boston Elevated R. R.....	100	10,000,000		2 1/2 % Aug. 99.	112	178	Pennsylvania Traction Co.....	100	10,000,000	9,900,000	—
Brooklyn N. Y.—Feb 4:											
Brooklyn City Ry.....	100	2,000,000	1,928,400		235	240	Lancaster & Col. Electric Ry.....	—			
Brooklyn Rap. Transit Co., tr. cert.	100	48,000,000	48,000,000		76 1/2	16 1/2	West End Street Railway.....	—			
Brooklyn Heights Railroad.....	—	200,000	200,000		107	109	Louisville, Ky.—Feb 4				
Brooklyn City RR.....	100	12,000,000	12,000,000	8 1/2 % Q., Jan.,	267	289	Louisville Ry.....com.	100	4,000,000	8,800,000	1 1/2 %
Brooklyn Queens Co. & Sub. RR.	—	2,000,000	2,000,000		—	—	Louisville Ry.....pfd.	100	2,500,000	2,500,000	3 1/2 % S. Oct. 1.
Caney Island & Brooklyn RR.....	100	2,000,000	1,884,200	2 1/2 % Nov., '99.	325	332	Minneapolis, Minn.—Feb				
Kings County Elevated.....	—	4,750,000	4,750,000		—	—	Twin City Rapid Transit.....com.	100	17,000,000	16,010,000	—
Kings County Traction Co.....	100	4,500,000	4,500,000	1 % July	75	80	Twin City Rapid Transit.....pfd.	—	8,000,000	1,712,300	1 1/2 % Oct.
Nassau Electric Railroad.....pfd.	50	6,000,000	6,000,000		—	—	Montreal, Canada.—Feb 4				
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000		—	—	Montreal Street Ry. Co.....	50	4,000,000	4,000,000	8 % S. M. & N.
Brooklyn, R. & W. R. Railroad.....	—	1,000,000	1,000,000		—	—	Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1 1/2 % S. J. & J.
Buffalo N. Y.—Feb 4											
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000		74	75	Memphis Tenn.—Feb 4:				
Buffalo Railway Co.....	100	6,000,000	5,570,500	1 % Q. Dec., '99.	99	100	Memphis Street Railway Co.....	100	500,000	500,000	—
Columbus O.—Feb 4											
Columbus Street Railroad.....	100	2,000,000	2,000,000	1 % Q., Feb.	85	89	New Haven, Conn.—Feb 4:				
Columbus Street Railroad, pfd.....	100	1,500,000	1,500,000		92	98	Fair Haven & Westville RR.....	25	2,000,000	2,000,000	8 % S. Sept.
Charleston, S. C.—Feb 4											
Charleston City Ry. Co.....	50	100,000	100,000	8 % S.	—	—	New Haven Street Railway Co.....	100	1,250,000	1,000,000	3 1/2 % A., July
Enterprise City RR. Co.....	25	1,000,000	250,000		—	—	New Haven & Centerville.....	100	700,000	800,000	—
Chicago, Ill.—Feb 4											
Chicago City Ry. Co.....	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99.	253	257	Winchester Avenue RR.....	25	1,000,000	800,000	—
Chicago & South Side R. T. RR.....	100	10,828,800	10,828,800		—	—	New Orleans, La.—Feb 4				
Lake Street Elevated RR.....	100	10,000,000	10,000,000		9 1/2	10	Canal & Claiborne RR. Co.....	40	340,000	340,000	4 % S. July
Metropolitan West Side Elev. Ry....	100	15,000,000	7,000,000	Feb 28 1900.	25	28	New Orleans & Carrollton RR.....	100	1,200,000	1,200,000	1 1/2 % Q., Oct.
Met. West Side El., pfd.....	100	15,000,000	9,000,000		79	86 1/2	New Orleans Traction Co new com.	100	—	—	—
North Chicago Street RR.....	100	10,000,000	6,000,000	8 % Q., Jan.	209	210	New Orleans Traction Co new pfd.	100	—	—	—
North Chicago City RR.....	100	800,000	249,900		197	200	Crescent City RR.....	100	2,000,000	2,000,000	8 % S. Jan.
South Chicago City Railway.....	100	2,000,000	1,608,200		99 1/2	100	New Or. City & Lake RR.....	100	2,000,000	2,000,000	4 % S. Jan.
West Chicago St. RR. Co.....	100	20,000,000	18,189,000	1 1/2 % Q., Feb.	99 1/2	100	Oreans Railroad.....	50	800,000	125,000	1 1/2 % S. June
Union Traction Ry.....com.	—	1,250,000	624,900	25 % S.	12	18	St. Charles Street Railway.....	50	1,000,000	1,000,000	1 1/2 % Oct.
Union Traction Co.....pfd.	100	2,000,000	2,000,000	5 % S.	49	50	New York—Feb 4:				
Cincinnati, Ohio.—Feb 4:											
Cincinnati Inc. Plane Ry.....com.	50	1,000,000	575,000		—	—	Central Crostown RR.....	100	600,000	600,000	2 1/2 % Q.
Cincinnati Inc. Plane Ry.....pfd.	50	150,000	150,000	1 % Feb.	—	—	Christopher & 10th Sts. RR. guar.	100	650,000	650,000	2 1/2 % Q. Oct.
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2 1/2 % Feb.	75	76	Dry Dock, E. Brd'wy & Battery RR.	100	1,200,000	1,200,000	1 1/2 % Q. Nov.
Cincinnati Street Ry. Co.....	100	18,000,000	14,000,000	1 1/2 % Q., Jan.	124 1/2	125	Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000	2 1/2 % Q., Feb. 1900.
Mt. Adams & Eden Park Inc. Ry.....	50	2,500,000	2,300,000	1 1/2 % Q., Jan.	128 1/2	127	Bleecker St. & Fulton Ry. guar.	100	900,000	900,000	2 1/2 % A., July.
Cleveland, Ohio.—Feb 4:											
Acron, Bd. & Oliv. Elec. Ry.....	100	1,000,000	1,000,000	3/4 % Jan.	48	50	Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000	2 1/2 % Q.
Cleveland City Ry.....	100	8,000,000	7,800,000	8-5 % Jan.	102	102 1/2	Con. Park N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2 1/2 % Q.
Cleveland Electric Ry.....	100	12,000,000	12,000,000	3/4 % Q., Oct., '99.	88	89 1/2	Eighth Avenue RR.....	100	1,000,000	1,000,000	—
Detroit, Mich.—Feb 4											
Detroit Citizens' Street Ry.....	100	2,000,000	1,250,000		100 1/2	—	42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	4 % Q.
Fl. Wayne & Belle Isle Ry.....	100	—	1,200,000		175	—	Ninth Avenue RR.....	100	800,000	800,000	—
Rapid Railway Co.....	—	250,000	250,000		90	100	Sixth Avenue RR.....	100	2,000,000	2,000,000	—
Detroit Electric Railway.....	—	1,000,000	1,000,000		—	—	Twenty-third St. R. R. Co. guar.	100	800,000	800,000	4 % Q.
Wyandotte & Detroit River Ry.....	100	250,000	200,000		100	110	Second Avenue RR.....	100	2,500,000	1,852,000	2 % Q., Jan.
Dayton O.—Feb 4											
City Railway Co.....com.	100	1,500,000	1,470,600	1 1/2 % Q.	140	145	Third Avenue RR.....	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.
City Railway Co.....pfd.	100	600,000	600,000	1 1/2 % Q.	170	—	42d St. Manhattan & St. Nich. Av	100	2,500,000	2,500,000	—
People's Street Railway.....	—	1,100,000	1,100,000		114	115	Union (Huckberry) Ry.....	100	2,000,000	2,000,000	—
Hartford Conn.—Feb 4											
Hartford Street Ry. Co.....	100	\$4,000,000	\$300,000	8 % S. Oct.	128	—	Newark N. J.—Feb 4				
Hartford & West Hartford RR.....	100	1,000,000	347,000	—	—	—	Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	—
Holyoke Mass.—Feb											
Holyoke Street Ry. Co.....	100	600,000	600,000	8 % A., June	207 1/2	213	North Jersey Railway Co.....	100	6,000,000	6,000,000	—
Hoboken N. J.—Feb 4											
North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %	180	—	United Elec. Co. of New Jersey...	100	504,000	504,000	11 1/2 % A.
Indianapolis, Ind.—Feb 4											
Indianapolis Street Ry.....	—	5,000,000	5,000,000	—	27	29	Pittsburg, Pa.—Feb 4:				
Lancaster, Pa.—Feb 4											
Pennsylvania Traction Co.....	100	10,000,000	9,900,000	—	—	—	Allegheny Traction Co.....	50	500,000	100,000	—
Lancaster & Col. Electric Ry.....	—			—	—	—	Consolidated Traction Co.....com.	50	15,000,000	15,000,000	2 1/2 % Jan.
West End Street Railway.....	—			—	—	—	Consolidated Traction Co.....pfd.	50	9,475,850	—	8 % Nov.
Louisville, Ky.—Feb 4											
Louisville Ry.....com.	100	4,000,000	8,800,000	1 1/2 %	112	112	Central Traction Co.....	50	1,500,000	—	1 1/2 % Nov.
Louisville Ry.....pfd.	100	2,500,000	2,500,000	3 1/2 % S. Oct. 1.	112	112	Citizens' Traction Co.....	50	8,000,000	—	6 % A.
Minneapolis, Minn.—Feb											
Twin City Rapid Transit.....com.	100	17,000,000	16,010,000	—	186 1/2	187 1/2	Duquesne Traction Co.....	50	8,000,000	—	8 % A.
Twin City Rapid Transit.....pfd.	—	8,000,000	1,712,300	1 1/2 % Oct.	186 1/2	187 1/2	Pittsburg Traction Co.....	50	2,500,000	—	8 1/2 % Nov.
Montreal, Canada.—Feb 4											
Montreal Street Ry. Co.....	50	4,000,000	4,000,000	8 % S. M. & N.	371	373	Federal St. & Pleasant Valley Ry...	25	1,400,000	—	2 1/2 % July.
Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1 1/2 % S. J. & J.	107 1/2	107 1/2	Pgh., Allegheny & Man. Trac. Co...	50	8,000,000	—	2 % Aug.
Memphis Tenn.—Feb 4:											
Memphis Street Railway Co.....	100	500,000	500,000	—	25	—	Pittsburg & Birmingham Trac. Ry.	25	1,500,000	—	1 % Oct.
New Haven, Conn.—Feb 4:											
Fair Haven & Westville RR.....	25	2,000,000	2,000,000	8 % S. Sept.	89	91	Pittsburg & West End Ry.....	50	8,000,000	—	5 % A., June
New Haven Street Railway Co.....	100	1,250,000	1,000,000	3 1/2 % A., July	—	—	United Traction Co.....com.	50	17,000,000	—	J. & J.
New Haven & Centerville.....	100	700,000	800,000	—	—	—	United Traction Co.....pfd.	50	8,000,000	—	J. & J.
Winchester Avenue RR.....	25	1,000,000	800,000	—	45	46					
New Orleans, La.—Feb 4											
Canal & Claiborne RR. Co.....	40	340,000	340,000	4 % S. July	—	—					
New Orleans & Carrollton RR.....	100	1,200,000	1,200,000	1 1/2 % Q., Oct.	148 1/2	158					
New Orleans Traction Co new com.	100	—	—	—	22 1/2	24					
New Orleans Traction Co new pfd.	100	—	—	—	25	26					
Crescent City RR.....	100	2,000,000	2,000,000	8 % S. Jan.	20 1/2	26					
New Or. City & Lake RR.....	100	2,000,000	2,000,000	4 % S. Jan.	—	—					
Oreans Railroad.....	50	800,000	125,000	1 1/2 % S. June	—	—					
St. Charles Street Railway.....	50	1,000,000	1,000,000	1 1/2 % Oct.	56 1/2	57					
New York—Feb 4:											
Central Crostown RR.....	100	600,000	600,000	2 1/2 % Q.	255	300					
Christopher & 10th Sts. RR. guar.	100	650,000	650,000	2 1/2 % Q. Oct.	175	185					
Dry Dock, E. Brd'wy & Battery RR.	100	1,200,000	1,200,000	1 1/2 % Q. Nov.	120	125					
Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000	2 1/2 % Q., Feb. 1900.	1 1/4	164 1/2					
Bleecker St. & Fulton Ry. guar.	100	900,000	900,000	2 1/2 % A., July.	85	87					
Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000	2 1/2 % Q.	282	240					
Con. Park N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2 1/2 % Q.	192	200					
Eighth Avenue RR.....	100	1,000,000	1,000,000	—	890	405					
42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	4 % Q.	892	402					
Ninth Avenue RR.....	100	800,000	800,000	—	198	201					
Sixth Avenue RR.....	100	2,000,000	2,000,000	—	286	235					
Twenty-third St. R. R. Co. guar.	100	800,000	800,000	4 % Q.	400	410					
Second Avenue RR.....	100	2,500,000	1,852,000	2 % Q., Jan.	198	201					
Third Avenue RR.....	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.	128	124 1/2					
42d St. Manhattan & St. Nich. Av	100	2,500,000	2,500,000	—	65	76					
Union (Huckberry) Ry.....	100	2,000,000	2,000,000	—	190	200					
Newark N. J.—Feb 4											
Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	—	6 1/2	61					
North Jersey Railway Co.....	100	6,000,000	6,000,000	—	24 1/2	24					
United Elec. Co. of New Jersey...	100	504,000	504,000	11 1/2 % A.	22	24					
Pittsburg, Pa.—Feb 4:											
Allegheny Traction Co.....											

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock. Authorized Issued.	Rate and Date of Last Div.	Bid.	Asked.
New Bedford Mass.—Feb 4	100	\$350,000	\$350,000 2%, Feb.	160	165
Union Street Railway Co.	100	800,000	225,000 4% A., June.	170	178
Northampton, Mass.—Feb 4	100	5,000,000	5,000,000 8% A. and N.	55	65
Northampton Street Ry.	100	1,250,000	1,250,000	54	—
Omaha, Neb.—Feb 4	100	8,000,000	8,000,000 3/4%, Oct. '98	110	111
Omaha Street Ry.	100	2,000,000	1,770,000 2%, Dec. '99.	28	24
Paterson, N. J.—Feb 4	100	1,966,100	1,966,100 2 1/2%, July 15, '99.	47	48
Paterson R. Co.	100	588,900	588,900 3 1/2%—July, '99.	75	76
Providence, R. I.—Feb 4	100	800,000	800,000 3% Feb. 1, '99.	75	76
United Traction & Electric Co.	100	30,000,000	29,980,450	82 1/4	84
Philadelphia.—Feb 4	50	500,000	8,297,920	845	—
Fairmount Park Trans. Co.	50	1,966,100	1,966,100 2 1/2%, July 15, '99.	47	48
Hestonville, Man. & Fairmount.	50	588,900	588,900 3 1/2%—July, '99.	75	76
Hestonville, Man. & Fairmount.	50	800,000	800,000 3% Feb. 1, '99.	75	76
Union Traction Co.	50	30,000,000	29,980,450	82 1/4	84
Electric Traction Co.	50	500,000	8,297,920	845	—
Frankford & Southwark Pass. R.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
Lehigh Avenue Ry. Co.	25	1,000,000	1,000,000 A. & O.	90	90 1/2
Lombard & South Street Ry.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
Second & Third Streets Ry.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
People's Traction Co.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
German town Passenger Ry.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
Green & Coates Passenger Ry.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
People's Passenger Ry.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
People's Passenger Ry.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
Philadelphia Traction Co.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
Catherine & Bainbridge St.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
Continental Pass. Ry. guar.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
Empire Passenger Ry. Co.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
Philadelphia City Pass. Ry.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
Philadelphia & Gray's Fy. RR.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
Philadelphia Avenue Passenger Ry.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
Philadelphia & Dart. Ry. guar.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
17th & 19th Sts. Pass. Ry. guar.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
Union Passenger Ry. Co.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
West Philadelphia Pass. Ry.	50	1,000,000	1,000,000 A. & O.	90	90 1/2
Rochester, N. Y.—Feb 4	100	5,000,000	5,000,000	20	23
Rochester Railway Co.	100	1,000,000	1,000,000	24	26
Reading, Pa.—Feb 4	50	850,000	850,000	138	—
Reading Traction Co.	50	1,000,000	1,000,000	70	—
City Passenger Ry.	50	1,000,000	1,000,000	—	—
East Reading Electric Ry.	50	1,000,000	1,000,000	—	—
St. Louis Mo.—Feb 4	50	800,000	150,000	—	—
South Street & Arsenal Ry.	50	400,000	400,000	—	—
Jefferson Avenue Ry. Co.	100	2,500,000	2,400,000	—	—
Lindell Ry.	100	2,500,000	2,400,000	—	—
National Railway Co.	100	2,500,000	2,400,000	—	—
Cass Avenue & Fair Grounds.	100	2,500,000	2,400,000	—	—
St. Louis RR.	100	2,000,000	2,000,000	—	—
Missouri RR.	50	1,000,000	1,000,000	—	—
People's RR. Co.	50	1,000,000	1,000,000	—	—
United Electric Ry.	100	1,000,000	1,000,000	—	—
United Electric Ry.	100	1,000,000	1,000,000	—	—
St. Louis & Suburban Ry.	100	2,500,000	2,500,000	—	—
Union Depot RR.	100	4,000,000	4,000,000	—	—
San Francisco, Cal.—Jan	100	1,000,000	600,000	117	119
California St. Cable RR.	100	1,000,000	875,000	60	—
Geary Street Park & Ocean RR.	100	18,750,000	18,750,000	61 1/2	68 1/2
Market Street Ry.	100	1,000,000	550,000	—	16
Presidio & Ferries RR.	100	1,000,000	550,000	—	—
Scranton Pa.—Feb 4	50	6,000,000	2,500,000	29	30
Scranton Railway Co.	100	500,000	500,000	16 1/2	—
Scranton & Carbondale Trac. Co.	100	1,050,000	1,050,000	—	—
Scranton & Pittston Trac. Co.	100	1,050,000	1,050,000	—	—
Springfield Ill.—Feb 4	100	750,000	750,000	—	—
Springfield Consolidated Ry.	100	750,000	750,000	—	—
Springfield O.—Feb 4	100	1,000,000	1,000,000	—	11
Springfield Street Ry.	100	1,000,000	1,000,000	—	—
Springfield, Mass.—Feb 4	100	1,200,000	1,166,700	207	212
Springfield Street Ry.	100	1,200,000	1,166,700	207	212
Toronto Canada.—Feb 4	100	6,000,000	6,000,000	108 1/2	109
Toronto Street Ry.	100	4,000,000	4,000,000	272 1/2	273
Montreal Street Railway Co.	100	4,000,000	4,000,000	—	—
Washington, D. C.—Feb 4	50	500,000	500,000	—	—
Belt Ry. Co.	100	12,000,000	12,000,000	102 1/2	102 1/2
Capital Traction Co.	50	400,000	400,000	—	—
Columbia Ry. Co.	50	707,000	652,000	85	40
Eckington & Soldiers' Home Ry.	50	200,000	200,000	29	21
Georgetown & Tenallytown Ry.	50	1,000,000	458,900	—	—
Metropolitan RR. Co.	50	1,000,000	458,900	—	—
Worcester, Mass.—Feb 4	100	8,000,000	8,000,000	8 1/4	35
Worcester Traction Co.	100	2,000,000	2,000,000	104	104
Worcester Traction Co.	100	550,000	542,500	—	85
Worcester & Suburban Street Ry.	100	550,000	542,500	—	85
Wilkesbarre, Pa.—Feb 4	100	5,000,000	5,000,000	25	29
Wilkesbarre & Wyoming Val Trac.	100	5,000,000	5,000,000	25	29

* Unlisted. † Paid in. ‡ Full paid. § Outstanding. ¶ Ex-div.
 a Leased to Hestonville, Man. & Fairmount Passenger Ry. for 6% on stock per annum.
 b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
 c Practically all shares owned by Union Traction Company.
 d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
 e Leased to Electric Traction Company.
 f Controlled by Frankford & Southwark Passenger Railway.
 g Leased to People's Passenger Railway at \$5 per share.
 h Leased to stock owned by People's Traction Company.
 i Majority of stock owned by People's Traction Company.
 j Leased to Union Traction Company.
 k Lease transferred to Union Traction Company.
 l Leased to Union Traction Company at a rental of \$10,000 per annum in 1886-7-8, to \$20,000 in 1899-1900 and \$30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.
 m Dividend of 10% guaranteed by Reading Traction Company.
 n Dividend of 6% guaranteed by Reading Traction Company.
 o Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock. Authorized Issued.	Rate and Date of Last Div.	Bid.	Asked.
Boston, Mass.—Feb 4	100	50,000,000	28,350,000	4 1/2% Q. Jan.	163 1/4
American Tel. & Tel. Co.	100	10,894,600	10,894,600	1 1/2% Q. Feb. 20,	135 1/2
Erle Telegraph & Telephone Co.	100	10,894,600	10,894,600	\$1.50 p. sh. Feb	135 1/2
New England Telephone Co.	100	10,894,600	10,894,600	\$1.50 p. sh. Feb	135 1/2
New York.—Feb 4	100	14,000,000	14,000,000	1 1/2% Q. Q.	91 1/4
American Telegraph & Cable Co.	100	14,000,000	14,000,000	1 1/2% Q. Q.	100 1/2
*Central & South Am. Tel. Co.	100	10,000,000	10,000,000	1 1/2% Q. Q.	173 1/2
*Commercial Cable Co.	100	1,000,000	1,000,000	1 1/2% Q. Q.	42 1/2
Franklin Tel. Co.	100	1,000,000	1,000,000	1 1/2% Q. Q.	173 1/2
Erle Telegraph & Telephone Co.	100	1,000,000	1,000,000	1 1/2% Q. Q.	42 1/2
*Gold & Stock Tel. Co. guar. 6%	100	5,000,000	5,000,000	1 1/2% Q. Q.	116 1/2
*International Ocean Tel. Co. guar. 6%	100	5,000,000	5,000,000	1 1/2% Q. Q.	116 1/2
Mexican Telephone Co.	100	2,000,000	2,000,000	1 1/2% Q. Q.	175 1/2
*New York & New Jersey Tel. Co.	100	5,000,000	5,000,000	2 1/2% Q. Jan.,	70 1/2
*Pacific & Atlantic Tel. Co. guar. 4%	100	2,000,000	2,000,000	2 1/2% Q. Jan.,	70 1/2
*Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1 1/2% Q. Jan.,	95 1/2
*Sout'n & Atlantic Tel. Co. guar. 5%	100	5,000,000	5,000,000	1 1/2% Q. Jan.,	115 1/2
*Commercial Union Telegraph Co.	100	5,000,000	5,000,000	1 1/2% Q. Jan.,	88 1/2
Western Union Telegraph Co.	100	97,870,000	97,870,000	1 1/2% Q. Jan.,	88 1/2
*Div. Union by Postal Tel. Co.	100	97,870,000	97,870,000	1 1/2% Q. Jan.,	88 1/2
Miscellaneous.—Feb 4	25	400,000	400,000	1 1/2% Q.	26 1/2
American Dist. Tel. (Phila.)	100	8,960,000	8,960,000	2 1/2% Q.	188 1/2
Bell Teleph. Co. (of Canada)	100	8,960,000	8,960,000	2 1/2% Q.	67 1/2
Chesapeake & Potomac Tel. Co.	100	8,960,000	8,960,000	2 1/2% Q.	200 1/2
Chicago Telephone Co.	100	8,960,000	8,960,000	2 1/2% Q.	148 1/2
Central Dist. Prtg. & Tel. Co. (Phg.)	100	750,000	750,000	2 1/2% Q.	75 1/2
Empire & Bay States Telegraph Co.	100	2,000,000	2,000,000	1 1/2% Q.	119 1/2
Hudson River Telephone Co.	100	2,000,000	2,000,000	1 1/2% Q.	122 1/2
*Northwestern Telegraph Co. guar.	100	2,500,000	2,500,000	2 1/2% Q.	16 1/2
Providence (R. I.) Tel. Co.	50	8,000,000	8,000,000	2 1/2% Q.	99 1/2
Southern New Eng. Tel. Co.	100	8,000,000	8,000,000	2 1/2% Q.	99 1/2

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

Boston, Mass.—Feb 4					115	125
Fort Wayne Electric trust receipts..	25	.....	.....	.....	15	25
Ft. Wayne Elec Co. T. Sec. Series A.	100	40,000,000	30,460,000	2 1/2 % Q., Aug., 1898.	91	121 1/2
*General Electric Co. [old] .. com.	100	18,276,000	18,276,000	1 1/2 % Q., Apr., 1900	22	28
General Electric Co. [new] .. " "	100	.....	.....	.....	55 1/2	55 1/2
T.-H. Elec. Co. T. Secur., Series C.	50	.....	146,700	.....	89 1/2	70
Westinghouse Elec. & Mfg. Co. com.	50	4,000,000	3,998,058	1 1/2 % Q., Jan.,	44 1/2	45
Westinghouse El. & M'g. Co. pfd.	50	11,000,000	8,195,126	.....	.....	.....
Westinghouse El. & M'g. Co. assent.	50	.....	.....	.....	.....	.....
New York.—Feb 4					119	120
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	.....	8	12
*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1 1/2 % Oct., '98.	.....	.....
Edison Ore Milling Co. com.	100	.....	.....	.....	.....	.....
Electric Vehicle Co. com.	100	40,000,000	30,460,000	2 1/2 % Q., Aug., 1898.	291	191 1/2
*General Electric Co. [old] com.	100	18,276,000	18,276,000	1 1/2 % Q., Apr., 1900	41	.....
General Electric Co. [new] .. " "	100	1,000,000	1,000,000	.....	110	125
Interior Conduit & Insulation Co...	100	2,500,000	2,500,000	A. & O.	.....	.....
^ Kings Co. El. L. & P. Co.	100	.....	.....	.....	.....	.....
Pittsburg, Pa.—Feb 4					168	172
Allegheny County Light Co.	100	500,000	500,000	J. & J.	.....	.....
East End Electric Light Co.	50	800,000	800,000	.....	.....	.....
Philadelphia, Pa.—Feb 4					144	144 1/2
Edison Electric Light Co.	100	2,000,000	.....	.....	74	80
*Electric Storage Battery Co. com.	100	8,500,000	.....	.....	75	82
*Electric Storage Battery Co. pfd.	100	5,000,000	.....	.....	18	18 1/2
Northern Elec. Light & Power Co..	10	550,000	550,000	.....	80	.....
Southern Elec. Light & Power Co..	10	187,500	187,500	.....	.....	.....
Miscellaneous.—Feb 4					47	48
Bridgeport (Conn.) Elec. Lt. Co...	25	500,000	.....	.....	20	21
Missouri-Edison (St. Louis) com.	25	.....	.....	.....	9	14
Eddy Electric Mfg. Co.	25	.....	.....	.....	175	176
Hartford (Conn.) Elec. Light Co...	100	850,000	.....	.....	6	10
Hartford (Conn.) Lt. & Power Co...	25	175,000	.....	.....	195	.....
New Haven (Conn.) Elec. Lt. Co...	100	100,000	.....	.....	108	101
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	.....	2 1/2 % Q., Oct.,	118 1/2	120 1/2
Rhode Island Elec. Protec. Co.	100	.....	.....	.....	206 1/2	208
Royal Elec. Co. (Montreal)	100	1,085,000	1,085,000	1 1/2 % Q.	183 1/2	185
Toronto (Canada) Elec. Light Co...	100	1,085,000	1,085,000	1 1/2 % Q.	105	100
Thomson-Houston Welding Co.	100	.....	.....	8 1/2 % S. Dec. 1,	105	106
Woonsocket (B. I.) Electric Co...	100	.....	.....	.....	.....	.....

ELECTRICITY.
BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

NAME.

Amount.

Interest

period.

Bid.

Asked.

NAME.

Amount.

Interest

period.

Bid.

Asked.

Albany N. Y.

Date of Quotation—Feb 4, 1901

The Albany Ry. Co. Cons. mtg. 5s.	\$500,000	427,500	1980	J. & J.	117%	....
The Albany Ry. Co. Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*116%	....
Watervliet Turnpike & RR. 1st mtg. 6s.	850,000	850,000	1919	M. & N.	*125	....
Watervliet Turnpike & RR. 2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	....
Troy City Railway Co. 1st 5s.	....	....	1942	....	*116%	....

Interest guar. by Albany Ry. Co.
Principal and interest guar. by
Albany Ry. Co.

Baltimore Md.

Date of Quotation—Feb 4, 1901

United Electric Ry. Co. 1st mtg. g. 4s.	88,000,000	18,000,000	1949	M. & S.	102	102%
Income 4s.	14,000,000	....	1949	J. & D.	74%	75
Baltimore City Pass. Ry. 1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118%	....
Baltimore Traction Co. 1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
Baltimore Trac. Co. Exten. & Imp. g. 5s.	1,250,000	1,250,000	1901	M. & S.	104%	....
Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s.	1,750,000	1,750,000	1942	J. & D.	121	121%
Bal. Trac. Co. Coll. Trust 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	....
Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102%	....
Central Pass. Ry. Co. 1st mtg. 6s.	96,000	117,000	1912	J. & J.	....	....
Central Pass. Ry. Co. Cons. mtg. g. 5s.	604,000	880,000	1982	M. & N.	119	121
City & Suburban Ry. 1st mtg. g. 5s.	8,000,000	8,000,000	1922	J. & D.	116	117
Lake Roland Elev. 1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	....

*All of the bonds of the above
companies, marked *, have been as-
sumed by the United Railways & Elec-
tric Company.

Boston Mass.

Date of Quotation—Feb 4 1901

Lynn & Boston RR. 1st mtg. g. 5s.	5,879,000	8,702,000	1924	J. & D.	114	115
West End Street Ry. Deben. g. 5s.	8,000,000	....	1902	M. & N.	104%	106
West End Street Ry. Deben. g. 4 1/2s.	2,000,000	2,000,000	1914	M. & S.	112	....

*\$1,874,000 in escrow to retire outstand-
ing bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Feb 4, 1901.

Enterprise Street RR. 1st mtg. 5s.	500,000	47,000	1906	J. & J.	....	....
Charleston City Ry. 1st mtg. 6s.	850,000	....	....	J. & J.	106	....

*Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Feb 4, 1901

Chicago City Ry. 1st mtg. 4 1/2s.	6,000,000	4,619,500	1901	J. & J.	101%	2%
Chicago Passenger Ry. 1st mtg. 6s.	400,000	400,000	1903	F. & A.	....	102
Chicago Passenger Ry. Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	....	....
Chicago & So. Side E. T. 1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T. 4 1/2s.	1,500,000	750,000	1907	J. & J.	....	....
Chicago West Div. Ry. 1st mtg. 4 1/2s.	4,040,000	4,040,000	1932	J. & J.	108%	109
Lake Street Elevated RR. 1st mtg. g. 5s.	7,574,000	8,781,200	1928	J. & J.	....	....
Metrop. W. Side Elev. Ry. 1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	66	96%
North Chicago St. RR. 1st mtg. 5s.	8,171,000	8,171,000	1906	J. & J.	106	....
North Chicago St. RR. Cert. Indeb. 6s.	600,000	500,000	1911	J. & J.	....	....
North Chicago City Ry. 1st mtg. 6s.	500,000	500,000	1900	J. & J.	....	....
North Chicago City Ry. consol. 4 1/2s.	2,500,000	2,500,000	1927	M. & N.	108	....
West Chicago St. RR. 1st mtg. 6s.	4,100,000	8,969,000	1928	M. & N.	....	111
West Chicago St. RR. Deben. 6s.	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR. Cons. mtg. g. 5s.	12,500,000	6,000,000	1988	....	106%	107
W. Chicago St. RR. Tunnel. 1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

*Redeemable at option on 60 da. notice.
*Funded debt assumed by Chicago W.
Div. Ry. Co., controlling interest of
which is owned by W. Chicago St. RR.
Co., lessee.

*Subject to call after Oct. 1, 1899, at
110 and interest.
*Assumed by W. Chi. RR. Co., lessee.
*Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Feb 4, 1901

Ch. New. & Cov. St. Ry. 1st Cons. mtg. g. 5s.	8,000,000	2,500,000	1922	J. & J.	114%	115
Mt. Adams & Eden Pk In. 1st mtg. 6s.	46,000	46,000	1900	A. & O.	108%	104
Mt. Adams & Eden Pk In. 1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	....
Mt. Adams & Eden Pk Inc. Cons. mtg. 5s.	581,090	581,000	1906	M. & S.	108%	....
So. Cov. & Cin. St. Ry. 1st mtg. 6s.	250,000	250,000	1912	M. & S.	121%	122%
So. Cov. & Cin. St. Ry. 2d mtg. 6s.	400,000	400,000	1982	J. & J.	182%	187

*Assumed by the Cin. St. Ry. Co.
*(\$250,000 reserved to retire 1st mtg. bds.)

Cleveland O.

Date of Quotation—Feb 4, 1901

Brooklyn Street RR. Co. 1st mtg. 6s.	600,000	600,000	1908	M. & S.	106%	107
Ch. New. & Cov. St. Ry. Cons. mtg. 5s.	8,000,000	2,500,000	1922	J. & J.	118%	114%
Cleveland City Cable Ry. 1st mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105%	106
Cleveland Electric Ry. Co. 1st mtg. g. 5s.	8,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry. 1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	....	....
East Cleveland RR. 1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	107%	....
Fl. Wayne (Ind.) Elec. Ry. 1st mtg. g. 5s.	600,000	....	1922	M. & N.	....	....
Lorain (O.) Street Ry. 1st mtg. 6s.	200,000	200,000	1915	J. & J.	....	....
St. Ry. Co., Grand Rapids. 1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....

*\$1,900,000 in escrow to retire bonds of
absorbed companies, marked a.
*Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Feb 4, 1901

Detroit Citizens' St. Ry. 1st mtg. 5s.	7,000,000	8,885,000	1905	A. & O.	....	102%
Fl. Wayne & Belle Isle Ry. 1st mtg. 6s.	400,000	877,000	1902	A. & O.	....	....
The Detroit Ry. 1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	106	106%

*\$1,150,000 in escrow to retire bonds of
Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Feb 4 1901

New Haven St. Ry. 1st mtg. g. 5s.	600,000	600,000	1918	M. & S.	111	....
New Haven (Edgewood Div.) 1st mtg. 5s.	250,000	250,000	1914	J. & D.	111	....
Winchester Avenue RR. 1st mtg. g. 5s.	100,000	800,000	1912	M. & N.	109	....
Winchester Avenue RR. Deben. g. 5	1,000,000	24,000	1912	M. & S.	....	....

*With interest *Unlabeled.

New Orleans La.

Date of Quotation—Feb 4 1901

Canal & Claiborne RR. cons mtg. 5s.	\$150,000	\$150,000	1912	M. & N.	....	....
Crescent City RR. 1st mtg. 6s.	....	50,000	1899	M. & N.	105%	....
Crescent City RR. Cons. mtg. g. 5s.	5,000,000	8,000,000	1948	J. & J.	....	....
New Orleans City RR. 1st mtg. 6s.	415,500	899,000	1908	J. & D.	108	112
N. Orleans City & Lake RR. 1st mtg. g. 5s.	5,000,000	2,599,500	1947	J. & J.	112	118
N. Orleans & Carrollton RR. 2d mtg. g. 5s.	850,000	850,000	1908	F. & A.	....	....
Orleans Railroad Co. Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	....	....
St. Charles St. RR. Co. 1st mtg. 6s.	800,000	75,000	1906	J. & D.	....	....

*\$428,500 in escrow to retire New Or-
leans City RR. Co.'s 1st mtg. bonds.
*\$90,000 outstanding.

New York

Date of Quotation—Feb 4, 1901

Atlantic Ave. (Brooklyn) Imp. g. 5s.	1,500,000	1,500,000	1884	J. & J.	95	....
Atlantic Ave. (Brooklyn) 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107%	110
Atlantic Ave. (Brooklyn) Cons. mtg. 5s.	8,000,000	1,968,000	1981	A. & O.	115	116
Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1948	J. & D.	128	126
Bro'dway & 7th Ave. 1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105%
Bro'dway & 7th Ave. 2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Bro'dway Surface. 1st mtg. 5s.	1,125,000	1,125,000	1924	....	115	117
Bro'dway Surface. 2d mtg. 5s.	1,000,000	1,000,000	1905	....	105	106
Brooklyn City RR. Co. 1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown. 1st mtg. 5s.	2,000,000	2,000,000	1989	J. & J.	115	116
Brooklyn Bath & W. E. RR. Gen. mtg. 5s.	1,000,000	448,000	1983	J. & J.	101	....
Brooklyn Heights RR. 1st mtg. 5s.	250,000	250,000	1941	A. & O.	104	....
Brooklyn, Q's Co. & Sub'n. 1st mtg. 5s.	8,500,000	8,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n. 1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit. gold 5s.	7,000,000	5,181,000	1945	....	109%	....
Bleecker St. & Fulton Ferry RR. 1st mtg. 7s.	700,000	700,000	1900	....	9%	100%
Cent Pk. N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crostown RR. 1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	....
Coney Island & Brooklyn RR. 1st mtg. 5s.	800,000	800,000	1908	J. & J.	101	108
Dry Dock, E. Bd'y & Bat'y RR. scrip 5%	100,000	1,100,000	1914	F. & A.	102	105
Elgin Av. RR. Co. Cert. Indeb. 6%	000,000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av. 1st mtg. 6s.	200,000	1,200,000	1910	M. & S.	116%	117
42d St., Man. & St. N. Av. 2d mtg. Inc. 6s.	1,500,000	1,500,000	1915	J. & J.	87	....
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1988	M. & S.	124	125
Metropolitan St. Ry. Co. g. m. cl. tr. g. 5s.	12,500,000	12,500,000	1997	F. & A.	....	....
Second Avenue Ry. Gen. cons. mtg. 5s.	1,600,000	1,600,000	1909	M. & N.	120	121
Second Avenue Ry. Deb. 5s.	800,000	800,000	1909	J. & J.	178%	109
Steinway Ry. (L. I.) 1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co. 1st mtg. 5s.	850,000	850,000	1919	....	110%	112%
Third Avenue RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1987	J. & J.	....	128%
Twenty-third Street Ry. 1st mtg. 6s.	....	....	1909	J. & J.	....	....
Twenty-third Street Ry. Deb. 5s.	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry. 1st mtg. 6s.	2,000,000	2,000,000	1942	F. & A.	118	116
Westchester Electric RR. 1st mtg. 5s.	500,000	500,000	1948	J. & J.	110	114

*\$1,085,000 in escrow to retire gen. mtg.
bonds.
*\$4,850,000 in escrow to retire maturing
obligations.
*\$552,000 in escrow to retire 1st and 2d
mtg. bonds.
*In treasury, \$80,000.
*Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Feb 4, 1901

Montreal St. Ry. 1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
Toronto St. Ry. 1st mtg. g. 4 1/2s.	4,550,000	2,200,000	1921	M. & S.	....	....

*\$85,000 per m. single track authorized.
*\$600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Feb 4, 1901

Continental Pass. Ry.....	1st mtg. 6s	850,000	810,000	1909	J. & J.	....
Empire Pass. Ry.....	1st mtg. 7s	800,000	700,000	1900	J. & J.	....
Greene & Coates St. Ry.....	1st mtg. 6s	100,000	100,000	1898	J. & J.	....
Lombard & So. St. Pass. Ry.....	1st mtg. 6s	150,000	150,000	1898	J. & J.	....
Long Island Pass. Ry.....	1st mtg. 7s	2,000,000	1,800,000	1900	J. & J.	....
Long Island Pass. Ry.....	2d mtg. 7s	2,000,000	1,800,000	1900	J. & J.	....
Long Island Pass. Ry.....	Cons. mtg. 5s	2,000,000	1,800,000	1900	J. & J.	....
Long Island Pass. Ry.....	Stk. trs. cert. g. 4s	2,000,000	1,800,000	1900	J. & J.	....
City Passenger Ry.....	1st mtg. 5s	1,000,000	1,000,000	1900	J. & J.	....
Philadelphia Trac. Co.....	Coll. tr. g. 4s	1,000,000	1,000,000	1900	J. & J.	....
North & 15th St. Ry.....	1st mtg. 7s	100,000	100,000	1898	J. & J.	....
Passenger Ry.....	1st mtg. 5s	500,000	500,000	1900	J. & J.	....
Passenger Ry.....	Coll. tr. 4s	500,000	500,000	1900	J. & J.	....
Grand Passenger Ry.....	1st mtg. 7s	1,000,000	1,000,000	1900	J. & J.	....
Philadelphia Pass. Ry.....	1st mtg. g. 5s	250,000	250,000	1898	J. & J.	....
Philadelphia Pass. Ry.....	2d mtg. 5s	250,000	250,000	1898	J. & J.	....

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	B. A.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation Feb 4 '11						
Jefferson Avenue Ry.....1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	108
Lindell Ry. Co.....1st mtg. 5s.	1,500,000	1,500,000	1911	F. & A.	108	109
Missouri RR. Co.....1st mtg. 5s.	1,000,000	700,000	1916	M. & S.	105	106
Mount City RR. Co.....1st mtg. 5s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co.....1st mtg. 5s.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 7s.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 5s.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric Ry. Co.	75,000	75,000	1905	J. & J.	100	101
St. Louis & E. St. L. Electric Ry. Co.	2,000,000	2,000,000	1900	M. & N.	99%	100%
St. Louis RR. Co.....1st mtg. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....1st mtg. g. 5s.	800,000	800,000	.....	.....	80	84
St. Louis & Sub. Ry.....Income 5s.	500,000	500,000	1909	M. & N.	108	108
Southern Electric Ry.....Cons. mtg. 5s.	500,000	500,000	1913	J. & J.	116	118
Taylor Avenue St. Ry.....1st mtg. g. 5s.	1,091,000	1,091,000	1900	A. & O.	100	100%
Union Depot RR. Co.....1st cons. mtg. 5s.	8,500,000	1,787,000	1918	J. & J.	121	122
Union Depot RR. Co.....Cons. mtg. 5s.						
Controlled by St. Louis RR. Co.						
Controlled by Union Depot RR. Co.						
Controlled by Lindell RR. Co.						
\$200,000 in escrow to retire 1st & 2d mtg.						
\$50,000 in escrow.						
\$100,000 in escrow to retir: 1st mtg. 5s.						
San Francisco Cal.						
Date of Quotation—Dec 1911.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
Ferries & Cliff House Ry.....1st mtg. 5s.	650,000	650,000	1914	M. & S.	.....	117
Geary St., Park & Ocean RR.....1st mtg. 5s.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. g. 5s.	8,000,000	8,000,000	1918	J. & J.	120%	.....
Metropolitan Ry. Co.....1st mtg. 5s.	200,000	2,000,000	1918	A. & O.	120%	.....
Omnibus Cable Co.....1st mtg. 5s.	850,000	850,000	1912	J. & J.	105%	107
Park & Cliff House RR.....1st mtg. 5s.	250,000	250,000	1914	J. & J.	115	.....
Park & Ocean RR.....1st mtg. 5s.	700,000	700,000	1912	M. & S.	.....	125
Powell St. Ry.....1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	.....	.....
Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Feb 4 1901						
Belt Ry. Co.....Cons. mtg 5s.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....mtg. 5s.	500,000	500,000	1914	A. & O.	183	.....
Hokington & Soldiers' Home.....mtg. 5s.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 5s.	500,000	500,000	1901	J. & J.	.....	.....
\$500,000 in escrow to retire 1st mtg. bds.						
Miscellaneous.						
Date of Quotation—Feb 4 1901.						
Bridgeport Traction Co.....1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	106	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 5s.	5,000,000	3,548,000	1931	F. & A.	118	.....
Buffalo St. R. (Ind. pols.) 1st cons. m. 5s.	4,000,000	2,000,000	1938	M. & N.	104	105
Chenango St. Ry. (Buffalo) 1st mtg. 5s.	8,000,000	2,866,000	1932	M. & N.	112	118
Croton (O.) St. Ry.....1st cons. g. 5s.	8,000,000	2,261,000	1932	J. & J.	115	.....
Columbus (O.) St. Ry.....1st mtg. 5s.	15,000,000	18,985,000	1938	J. & D.	111%	111%
Consolidated Traction (N. J.) 1st mtg. 5s.	2,000,000	572,000	1920	J. & D.	115	115%
Croton St. Ry. (Colu's O.) 1st mtg. 5s.	4,000,000	2,800,000	1920	J. & J.	80	85
Denver City Cable Ry.....1st mtg. g. 5s.	4,000,000	922,000	1938	A. & O.	119	119%
Denver City Tramway Co.....Con. m. g. 5s.	6,000,000	4,981,000	1930	J. & J.	110%	110%
Louisville (Ky.) Ry.....1st cons. mtg. g. 5s.	5,000,000	4,060,000	1919	J. & J.	108	.....
Minneapolis St. Ry. (N. J.) Cons. mtg. 5s.	8,000,000	2,878,000	1928	J. & J.	.....	.....
No. Hudson Co. Ry. (N. J.) 2d mtg. 5s.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.) Deb. 5s.	500,000	489,000	1902	F. & A.	.....	.....
No. Hudson Co. Ry. (N. J.) Cons. mtg. g. 5s.	1,250,000	1,000,000	1931	J. & D.	.....	.....
Paterson (N. J.) Ry.....1st mtg. 5s.	8,000,000	2,000,000	1930	A. & O.	105%	108
Rochester (N. Y.) Ry.....1st mtg. 5s.	5,500,000	4,298,000	1937	.....	108	.....
St. Paul City Ry.....Deb. g. 5s.	1,000,000	1,000,000	1900	.....	.....	.....
St. Paul City Ry.....Deb. g. 5s.						
\$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
\$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
\$750,000 in escrow to retire bonds of C. St. RR. Co.						
\$97,000 in treasury.						
\$900,000 reserved to redeem prior liens						
\$620,000 in escrow.						
*With int'res						

*With int'res

ELECTRIC LIGHT AND ELECTRICAL MFG. CO'S

Boston, Mass.						
Date of Quotation—Feb 4 1901						
Delaware Gas Lt. Co.....1st m. 5s. g.	800,000	800,000	.....	J. & J.	106	108
Edison Elec. Illuminating Co., Boston.....	2,025,000	.....	1922	Quar.	167	.....
General Electric Co. gold coup. deb. 5s.....	10,000,000	8,750,000	.....	.....	116	.....
Pittsburg Pa.						
Date of Quotation—Feb 4, 1901						
Allegheny County Light Co.....5s.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Scrip 5s.	196,570	.....	.....	M. & S.	.....	.....
Miscellaneous. —(Feb 4 1901.)						
Edison El. Ilig. Co. (N. York) 1st m. 5s.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilig. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1938	.....	124	.....
Edison Elec. Ilig. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122%	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	100	103
Edison Electric Light (Phila) 1st mtg. 5s.	2,500,000	.....	1937	A. & O.	120	122
Kings Co. El. Lt. & Pow. Co. 1st money 5s.	5,176,000	.....	1937	A. & O.	102%	.....
Kings Co. El. Lt. & Po. Co. pur. money 5s.	8,000,000	.....	.....	F. & A.	.....	.....
Milwaukee El. Ry. & Lt. Co. 1st con. g. 5s.	5,000,000	.....	.....	.....	.....	.....
United Elec. Light & Power Co. (N. Y.).....	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—Feb 4 1901						
American Bell Telephone.....4s.	.....	.....	1908	F. & A.	100%	101
Northwestern Telegraph Co.....7s.	.....	.....	.....	.....	114	115
N. Y. & N. J. Tel. & Tel. Co. gen. mtg. 5s.	.....	.....	1911	J. & D.	108	108
Chesapeake & Potomac Tel. Co.....5s.	.....	.....	.....	.....	.....	.....

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—Feb 4 1901						
American Electric Heating.....7s.	500,000	500,000	.....	.....	.....	25
Armington & Sims Engine Co.....6s.	.....	.....	1942	J. & J.	106	107
Barney & Smith Car Co.....6s.	.....	.....	1904	J. & D.	.....	.....
Carborundum Mfg Co.....6s.	75,000	.....	.....	.....	118	127
Worthington Pump Co.....Nominal	.....	.....	.....	.....	.....	.....

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16% @ 16% c.; Lake, 16% @ 16% c.; casting, 16% @ 16% c.

The directors of the Hartford (Conn.) Electric Light Company have declared a semi-annual dividend of 3½ per cent., payable February 15.

The Detroit United Railway Company has declared a quarterly dividend of 1 per cent., payable March 1. Books close February 15 and reopen March 2.

The annual meeting of the stockholders of the Commercial Cable Company will be held in New York on March 4. Books close February 21 and reopen on March 5.

Stockholders of the Metropolitan Street Railway Company of New York will meet February 8 to consider the issue of \$1,400,000 bonds for extensions and improvements.

Wall Street is again filled with rumors of a pending deal between the Metropolitan and Manhattan roads of New York. The New York Central is now connected with the deal.

The adjourned meeting of the stockholders of the Brooklyn Rapid Transit Company was held on February 1, but immediately adjourned without day and without taking any action.

It is understood that negotiations have been completed by which the United Electric Company of New Jersey secures control of all the gas and electric lighting companies in Northern New Jersey.

A dispatch from Boston states that the trustees of the Street Railway & Illuminating Properties have declared a distribution of \$3 per share on February 7 to holders of common stock February 2.

It is said that the street railway system of Detroit has been sold to a syndicate, of which Henry A. Everett of Cleveland, O., is the head. The company organized to purchase the property is capitalized at \$23,500,000.

The annual report of the Independent Union Telephone Company of Buffalo, N. Y., recently filed, shows that 150 shares have been actually issued. The whole capital stock of the company is \$200,000, divided into 2,000 of \$100 each.

The South Side Elevated Railroad Company of Chicago reports for the year ended December 31 last: Gross earnings, \$1,286,635; operating expenses, \$748,402; net earnings, \$538,233; deducting interest and dividends there remains a balance of \$197,720.

Common stockholders of the Schuylkill Traction Company of Philadelphia have been notified that under the readjustment plan they may not later than February 16 exchange their holdings for 25 per cent. in preferred stock at the Fidelity Trust Company's offices.

The authorized capital of the Electric Vehicle Company is now \$9,000,000 preferred and \$11,000,000 common stock, of which \$8,125,000 and \$10,450,000, respectively, is now outstanding. Comparing this with previous reports of the company, it would appear that the payment for the Riker Motor Vehicle Company was made with \$725,000 preferred stock and \$1,050,000 common stock.

The stockholders of the New York & New Jersey Telephone Company will hold a meeting in Brooklyn on March 1 for the purpose of voting on a proposition to increase the capital stock of the company from \$8,000,000 to \$15,000,000. It is the purpose of the directors to offer the new stock to the present shareholders from time to time in such amounts as may be needed in the construction requirements of the company.

A special meeting of the stockholders of the Westinghouse Electric & Manufacturing Company will be held on February 20 at the general office of the company at East Pittsburgh, Pa., for the purpose of voting for or against an increase of the capital stock of the company, such new stock to be made second preferred stock, otherwise known as "assenting stock." The transfer books closed on February 5 and reopen February 21.

The Central Electric Company has awarded to J. S. Rippel of Newark, N. J., \$150,000 of its \$750,000 five per cent. first mortgage forty-year gold bonds. The mortgage covers all the property now owned or hereafter acquired, including plants in Rahway, Perth Amboy, New Brunswick, Bound Brook, Dunellen and Metuchen. The proceeds of the present sale will be used to defray the cost of extensions at the new plant at Metuchen. The bonds are dated July 1, 1900; interest payable January 1 and July 1; trustee, Fidelity Trust Company of Newark.

At the annual meeting of the stockholders of the Erie Telegraph & Telephone Company on January 31 the by-laws were amended changing the date for the annual meetings to the Thursday preceding February 1 in each year. They also decided to reduce the board of directors from 25 to 15. The new board of 15 was then elected and is as follows: Edward Abbott, Walter Abbott, A. B. Chandler, Frank A. Cutting, Philip Dexter, William Endicott, Jr., Frederick A. Farrar, Reginald Foster, Charles J. Glidden, Francis R. Hart, William J. Latta, Frank M. Riter, James J. Storrow, Charles S. Tuckerman and Henry R. Wilson.

The annual general meeting of the shareholders of the Ottawa (Can.) Electric Railway Company was held at Ottawa on January 30. The annual report and financial statement for the year ending December 31 last showed a most satisfactory year's business. Four quarterly dividends of 2 per cent. each were paid and a substantial balance carried to the credit of profit and loss. There were 7,940,656 passengers carried during the past year, making an increase of about 2,000,000 over the year previous. The following directors for the current year were elected: T. Ahearn, George P. Brophy, Peter Whelen, Warren Y. Soper, Thomas Workman, A. Lumsden and Hon. Senator Cox. Mr. T. Ahearn was elected president, Peter Whelen vice-president and James D. Fraser secretary-treasurer.

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EDITORIAL NOTES.

The Street Railways of Massachusetts.

It is no exaggeration to say that in no State in the Union is the subject of street railways and street railway regulation given such thorough attention as in Massachusetts. As a result, many of the electric lines are in a thriving condition, and pay dividends to the investors, which is by no means always the case in other States, owing too frequently to a generous dilution of the capital stock of a company with water.

An advance copy of the thirty-second annual report of the Board of Railroad Commissioners of Massachusetts has just been issued, which contains a vast amount of valuable information, especially from the point of view of the street railway investor. The report is for the year ending September 30, 1900, and gives statistics relating to 118 street railway companies, or two more than in 1899. At the end of the year 72 out of the 118 companies were operating their railways; the railways of 14 companies were operated by other companies under lease or contract; 9 companies had organized and were constructing their railways; three companies had organized and paid in a portion of their capital stock, but had not commenced the construction of their railways, while 20 companies had been consolidated with other companies during the year.

The report shows that there are 2,037.74 miles of single track owned, an increase over 1899 of 192.03 miles. Of this total amount of track 1,972.55 miles are being operated; 4.75 miles by horse power, the balance by electricity. The fact that there are but 4½ miles of horse car lines in Massachusetts certainly speaks well for the progressiveness shown by the inhabitants of the State.

In 1860 there were but 20 street railway companies in Massachusetts operating 88.87 miles of track by means of horse power. In 1889 there were 50.5 miles of electrically operated roads against 523.65 miles of track on which the cars were operated by animal power. During 1891-1892 there were 207.3 miles of electric roads built or converted from horse power to electricity, which left 258.55 miles of the former as against 496.3 miles of the latter.

The average cost of the street railways of Massachusetts per mile of main track (includ-

ing the cost, but not the length of side track), as it stood on the books of the companies September 30, 1900, was \$23,443.43 for construction; \$8,510.13 for equipment, and \$11,683.82 for lands, buildings (including power plants) and other permanent property—making a total average cost of \$43,637.38 per mile of main track. The gross assets of the companies on the date mentioned above were \$98,700,074.53.

The total capital investment (capital stock and net debt) of the companies in question advanced the last year from \$68,758,800 to \$77,226,214. In 1888 the total was only \$17,237,100; so that the capital investment has more than quadrupled since the introduction of electricity as motive power.

The total amount of dividends declared the last year was \$2,409,874—an increase of \$91,476 over the preceding year. Forty-eight out of the 118 companies paid dividends; 14 paid 8 per cent.; 1 paid 8 per cent. on preferred, and 7 per cent. on common stock; 3 paid 7 per cent.; 1 paid 6½ per cent.; 12 paid 6 per cent.; 2 paid 5 per cent.; 1 paid 4½ per cent.; 1 paid 4 per cent.; 3 paid 4 per cent.; 1 paid 3½ per cent.; 3 paid 3 per cent.; 3 paid 2½ per cent.; 2 paid 2 per cent. and 1 paid 1 per cent.

The amount of the capital stock upon which dividends were paid of the 48 dividend-paying companies was \$38,901,700.00, on which the average rate was 6.19 per cent.

The total number of passengers carried on all the roads during 1900 was 395,027,198, or an average of 51 passengers per round trip.

An interesting part of the report is that which deals with the cost of operation per car mile. In 1891 the average expense of operating a car one mile was 24.38 cents; whereas in 1900 the cost was 16.10 cents. The expense of operation per passenger carried is given as 3.33 cents.

Mention is made in the report of the wisdom of the legislation known as the "Anti-stock watering laws," which restricts original issues of street railway securities to the amount requisite for cost of construction and equipment, and forbids additional issues where the capital or assets have become impaired until such impairment is made good, and prohibiting the issue of bonds unless the physical assets of the company are equal to its aggregate outstanding indebtedness.

Taking it all in all the report is replete with valuable information and statistics, which goes to show the thoroughness with which the Railroad Commissioners have examined into

the subject. It might further be added that this report should be in the hands of all persons interested in electric street railway undertakings.

* * *

Some Experiments in Wireless Telegraphy in This Country.

Reports have reached this country from abroad of the numerous experiments in wireless telegraphy that have been going on with a view to perfecting the Marconi system for signaling between a land station and a ship at sea. Exhaustive tests of this nature have been carried on with boats crossing the English Channel, it being no unusual thing to transmit intelligible messages a distance of from eighty to ninety miles. We now hear of some experiments the Weather Bureau in Washington has been making on the quiet for about a year with a system of wireless telegraphy which is said to differ materially from that of Marconi. Referring to the subject Prof. Willis Moore of the Weather Bureau is reported as saying:

"We have succeeded in telegraphing perfectly with our wireless system for sixty miles over a rough country around Washington.

"About a year ago we secured Cobb's Island, sixty-five miles down the Potomac. We wanted privacy. We have worked down there for a year, and we put up workshops and towers whenever we needed them, but so far as I know the newspapers of the country have not even heard of the existence of the plant.

"Prof. Fessenden was in charge, with two assistants and a force of laborers. As often as possible Prof. Abbey and myself of the Bureau would go down to help.

"The tests started with experiments in transmitting the ethereal vibrations at fixed distances, under varying conditions. Then we tested the wireless transmission of waves.

"As a result we have developed apparatus of our own that is quite distinct from the machinery used by Marconi. In fact our methods and his are altogether different. What those methods are, however, I do not wish to say.

"We succeeded in sending messages for some distance from a staff only three feet high. The transmission of wireless messages was not limited to the island. We established communication between the laboratory and Washington, a distance of about sixty miles over a rough country.

"On a farm near Fort Meyer, just across the river from Washington, was a staff about one hundred feet high on the place, and at the top of it we placed our instruments. We were able to communicate with the islands freely as though we were working over a wire.

"We used a system of dots and dashes, and our receiver was of the 'sounder' type. We read messages by sound. We expect, however, to develop a receiver that will record messages."

A dispatch from Washington states that with this system it will be feasible to signal ships at a distance of 500 miles or more out at sea. As no authority is given for this statement it is scarcely to be credited, and may safely be put down to the imaginings of an enterprising representative of the daily press.

It is interesting to note however that besides the wireless telegraphy station at Roanoke, N. C., there will shortly be two others erected, one at Hatteras and the other at Cape Henry.

A New Electrical Law.

Nikola Tesla claims to have discovered a new law in electrical science which will necessitate the rewriting of most of the text books now in use. He asserts that the capacity of an electrical conductor, such as a metallic sphere, varies under different conditions, and that he has found out the law which governs this phenomenon. Referring to the subject he says:

"Electricians and physicists have assumed that the electrostatic capacity of a conducting body, say of a metallic sphere, which is frequently used in experiments, remains a fixed and unalterable quantity, and many scientific results of the greatest importance are dependent on this assumption.

"Now, I have discovered that this capacity is not fixed and unalterable at all. On the contrary, it is susceptible to great changes, so that under certain conditions it may amount to many times its theoretical value, or may eventually be smaller.

"In estimating the wave-length of the electrical vibration in the transmitting and receiving circuits, due regard must be had to the velocity with which the vibration is propagated through each of the circuits, this velocity being given by the product of the wave length and the number of vibrations a second—the rate of vibration being, however, as before stated, dependent on the capacity and inductance in each case. I obtained discordant values.

"Continuing the investigation of this astonishing phenomenon I observed that the capacity varied with the elevation of the conducting surface above the ground, and I soon ascertained the law of this variation. The capacity increased as the conducting surface was elevated, in open space from one-half to three-quarters of one per cent, per each foot of elevation. In buildings, however, or near large structures, this increase often amounts to 50 per cent, per foot of elevation, and this alone will show to what extent many of the scientific experiments recorded in technical literature are erroneous.

"Far more interesting, however, for men of science is the fact discovered later that the capacity undergoes an annual variation with a maximum in summer and a minimum in winter. In Colorado, where I continued with improved methods the investigations begun in New York, and where I found the rate of increase slightly greater, I furthermore observed that there was a diurnal variation with a maximum during the day and a minimum during the night. Further, I found that sunlight causes a slight increase in the capacity. The moon also produces an effect, but I do not attribute it to its light."

This statement of Mr. Tesla's is extremely interesting and should furnish electrical scientists an opportunity of airing their views on the subject.

A few months ago a special committee was appointed by the City Council of Montreal to report upon the best course to adopt in regard to the electric lighting of the city, upon the expiration of the present lighting contract with the Royal Electric Company. The committee did not favor municipal ownership, but recommended that public tenders for the new lighting contract be called for, and that the specifications contain certain conditions which do not apply to the existing contract. The

following objections to municipal ownership were given: That it would cost the city an immense sum to purchase such a plant; that the city would find it costly to operate such a plant by steam power; that there was an unfavorable outlook of getting water power, without purchasing it from the companies, on account of so many water power companies operating water plants in the vicinity of Montreal; that if water power was bought, it would cost the city as much to manufacture electricity, as if produced by coal; and, finally, under these conditions, it would be better to give the lighting out by contract and to have the keenest private competition for the service.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

THE annual meeting of the American Physical Society will be held in New York on the 23d inst.

DURING the year 1900 the capital involved in electrical undertakings in Great Britain was increased from \$525,000,000 at the beginning of the year to about \$625,000,000 at its close. This is exclusive of Government telegrams and telephones, the greatest increase being in connection with the supply, traction and manufacturing works. In five years the total capital has been doubled, and in electrical manufacturing alone the five years have shown an increase from \$32,500,000 to \$110,000,000, \$25,000,000 being for the year 1900. In the electric traction, lighting and power interests the increase in the same time was from \$70,000,000 to \$275,000,000, and is likely to be still further increased in the next year or two, as in 1900 ninety-eight provisional orders were granted by Parliament, and many of the eighty-nine stations authorized in 1899 are not included in the capitalization given.

LLOYDS have been in communication with the Canadian Department of Marine on the subject of establishing one of their reporting stations on Belle Isle, off the coast of Labrador, and they have been assured of the active assistance from the department in their project. They are also considering the feasibility of connecting Belle Isle with the mainland by a system of aerial telegraphy, so that communication would not be interrupted by a break in the cable.

THERE are some 310 vessels with more than 2,000 men employed in the sponge industry about the coast of Florida. As it takes at least a year for a sponge to grow to a moderate size, and the grounds are fished over several times every twelve months, the large sponges have all been removed from the available portions of the ocean's bed, and the great fleet of fishing vessels keep the product limited to sponges of small value. The United States Commission of Fish and Fisheries has recently taken steps towards the regulation of this wholesale destruction of the young sponges on those submarine plateaux which are now accessible. The operation of collecting the sponges is very simple, the fisher spearing with a long pole all those which he can see by the aid of a water-glass. The depth of water, therefore, in which they can be obtained is only limited by the distance penetrated by the light. If this distance could be increased, large areas would im-

mediately be open up where sponges have been growing unmolested for years, and the production would be not only greatly increased in quantity, but the quality would probably be as fine as that from any part of the world. Experiments are soon to be made upon a new submarine electric arc lamp to ascertain by practical demonstration the feasibility of reaching these lower strata by its means, and if successful its application to this important industry will undoubtedly follow.

A RESIDENT of St. Louis has patented an electrical race horse starting gate.

A SWEDISH engineer, Herr Kjellin, manager of the Gysinge Iron Works, claims to have invented a method for the manufacture of steel by electric power, of which the details will be made known as soon as the process is patented, says the "Electrician," London. The quality of the steel is claimed to be excellent, and the cost of production low. At present he is turning out only about a ton a day, owing to the want of electric power at the works; but plans are being prepared for obtaining sufficient power from the falls in the River Dalelven, some distance from the works, where a powerful generating station is to be constructed, when the steel manufacture will be carried out on a large scale.

GERMAN experiments in applying X-rays to old masters to establish their authenticity has created considerable talk and interest in local art circles. Experts here are not wholly agreed upon the subject. According to special cable dispatches in the "Herald" from Berlin, a work in Ratlsbonne, which was supposed to be a Durer, dating back to 1521, was subjected to X-rays, with the result that Durer's monogram and the date 1524 were revealed. The painting was on silk, stretched over an oak board two centimeters (.79 inch) thick.

A BILL intended to prevent "record automobile trips" was introduced at Albany last Friday by Assemblyman S. W. Smith of Columbia County. The bill provides that the boards of supervisors of each county shall have power to enact local and private laws limiting the speed of all vehicles within their respective confines.

Gov. DUBIN of Indiana recently signed the bill providing for the electrocution of murderers instead of hanging them.

A FRENCH experimenter, according to the N. Y. "Sun," has devised a differential apparatus which, while not preserving the secret of wireless telegraph messages, enables the sender to communicate at will with one or the other of two stations situated at different distances. This scheme involves the use of four mast-wires of different ranges, two at the sending stations, and two at the receiving stations. The heights of the masts are so arranged that one of them covers, say, a range of five miles, while the other does not. By this means, it is asserted, the object sought can be attained.

A DISPATCH from London states that the completion of the great Nile dam at Assuan, so far as to practically control the flow of the river, was announced last week by Sir John Aird, the contractor. His message was: "The last channel has been closed at Assuan. You

can now walk across the Nile." This will solve the problem of providing corn in Egypt. The excellent piece of dam construction will have to withstand a severe strain when the Nile rises with the next floods.

THE War Department recently made public another large portion of the Taft Commission's report, dated at Manila, of which the most important part is that relating to the market for American products in the Philippine Islands. It is stated that there will be a steadily increasing call for American electric machinery. At present Manila is the only city in the islands which has electric lights, the small plant at Iloilo having been burned. There are no electric railways in the islands, and it seems certain that there will be a great future for them there.

A REFUSE destructor and electric generating plant is to be erected in London in the suburb of Hackney. Apparatus will be installed having an initial capacity of 3,000 horse power, which will be sufficient in connection with storage batteries to supply current to 50,000 eight-candle power incandescent lamps. The refuse destructor will consist of twelve furnaces with a daily consuming capacity of 150 tons. The cost of the plant will amount to about \$1,250,000. The charge for electric lighting to both private and public consumers will be at higher rates than for the supply of power.

A BILL has been introduced in the Legislature at Albany, which if passed, will give the Railroad Commission of New York State full authority over gas and electric lighting, heating and power companies.

A SYNDICATE has been formed which intends to consolidate all the street railway lines in the more important cities in Northern Indiana, Northwestern Ohio and Southern Michigan and the interurban roads. The first step in the deal was the transfer recently of the Lafayette city lines to a company with \$800,000 capital, composed of Eastern and Western financiers. New York and Philadelphia capitalists are interested, but their names have not been made public.

SOME tests have been carried out by the German Post Office officials on the new electric tramway at Bielefeld, to ascertain whether the protection of telephone and telegraph wires crossing above the trolley wire was sufficient. Above each trolley wire at places where wires of the other service cross it are copper guard wires, directly connected to the rail return of the trolley line system. On a telephone wire falling over the trolley wire it first came in contact with the guard wire, and then short-circuited this to the trolley wire, causing the cutout in the station to come into action. So effective is this said to have been that, in three experiments, the delicate fuse at the far end of the telephone wire was in no case melted. The only novelty, if any, says the London "Electrician," appears to be in earthing the guard wire directly to the rails instead of merely to the pole or an earth plate. Everything of course depends on the adjustment of the station cut-out, but the expedient of connecting the guard wire directly to the rails, and so to ensure as effective a short-circuit as possible, in the event of contact between the telephone wire and the trolley wire, appears a good one.

THE latest and most practical use to which an electromobile has been put occurred the other day in Boston, when one of the vehicles was used to pull a horse out of a hole in the street into which he had fallen and where he was stalled.

A NEW apparatus has recently been invented abroad for examining boiler tubes. It consists of a tube fixed at right angles in a chamber provided with a magnifying eye-piece. At the further end of the inspection tube, which is capable of being drawn out to suit the length of the boiler tube under examination, is an incandescent electric lamp, and an angular plane reflector which transmits the rays to a reflector inclined at a similar angle under the eye-piece. The tube in process of inspection is fixed in a traveling carrier, which permits every part of it to be examined in turn. The carrier is provided for this purpose with both a horizontal and a rotary movement. The present apparatus is designed for tubes of 6.56 feet in length by 1½ inches in diameter, but the same principle can be applied to tubes of larger size and greater length. An apparatus for use in the case of tubes "in situ" has also been devised. It is stated that this invention has proved very satisfactory in use, and that it has often revealed defects in the interior of tubes which externally presented every appearance of soundness.

AN electrician of Albany has applied for a patent on an electric mail box, which is intended for houses. It is small, and is so arranged that when the letter carrier deposits a letter in the box he presses a push button, which is connected with an annunciator within the building. A drop comes down showing the word mail. The household knows at once that the mail is at the door. Any mail for the carrier is placed on the box, where there is a wire rack for papers. The battery is in the top of the box, and not in the house. It is readily accessible and requires but little attention, no more than an ordinary electric door bell.

THE Brussels correspondent of the London "Globe" states that the attempts to communicate from Brussels to Antwerp, and vice versa, by means of Marconi's system of wireless telegraphy, have proved failures. M. Guarini, who conducted the experiments, expresses himself disappointed, but by no means disconcerted, although he cannot explain the cause of several of the trials being unsuccessful. The experiments were made between Brussels and Antwerp direct, without using the intermediate repeater at Malines. In a few days' time an attempt will be made to telegraph atmospherically over the shorter distance.

A RESIDENT of Hanau-on-the-Main, Germany, has taken out a patent on a method of soldering aluminum. The process is based on observations, which had not previously been made, that aluminum becomes soft at a certain temperature, at which, by hammering, it can be joined to another piece heated to the same temperature in such a manner as to give an absolutely homogeneous whole. The surfaces to be united are brought together to a temperature at which the metal commences to soften, but without forming the skin of oxide, which hinders welding; the said surfaces are then hammered or worked in any way until the joint has, so to speak, disappeared and the two surfaces form a solid body.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 14.

ALTERNATING CURRENTS.

An alternating current is one that is continually reversing its direction of flow, and is generally understood to be a current that reverses its direction at every pulsation. A good example of an alternating current is that which is produced by an ordinary magneto generator, such as is used in telephone work. A magneto generator is made up of a single coil of wire which is revolved between two magnetized pole pieces, the terminals of the wire being connected to two points which are kept continually in contact with the exterior circuit by means of brushes.

The ordinary alternating current dynamo or alternator is constructed on this same principle, but is usually made with a number of coils on the armature and an equal number of poles in the field magnets.

An alternating current is said to make as many alternations per minute as it makes changes in direction in each minute. Instead of speaking of the number of alternations per minute of an alternating current, it is quite common to speak of its frequency, which is the number of double alternations made by the current per second. The number of alternations per minute that an alternating current dynamo will give out is equal to the number of pole pieces in the field magnet multiplied by the number of revolutions made by the armature per minute. To find the number of alternations per second, divide by 60, and to find the frequency divide the result by 2, for a frequency is a double alternation. So to find the frequency of a machine, divide the alternations per minute by 120.

An alternating current when applied to operating an incandescent lamp has just the same effective value that a direct or continuous current would have, that is to say, an alternating current operating at 110 volts pressure would give practically the same results on lighting a 110 volt incandescent lamp that a direct current of 110 volts would give, also the amount of current flowing through the lamp would show to be the same in each case, if measured with properly calibrated and correct reading ammeters. The amount of power used in each case could be indicated by $C \times E$ and would be correct.

However there is one very important point in which alternating currents differ radically from direct or continuous currents. Now suppose we take a long piece of copper wire having a resistance of 110 ohms, a direct current operating at 110 volts would, according to Ohm's Law, force one ampere of current over that resistance and it would do that regardless of whether the wire be laid out straight, coiled up, or wound on an iron core. It does not change the actual resistance of the wire any to place it in any of these forms and therefore the direct current of 110 volts would force a flow of one ampere over it just the same. This would not be so, however, were an alternating

current of 110 volts applied to these conditions. When the wire is laid out straight there would be one ampere of current flowing just the same as when the direct pressure was applied, but when the wire is wound in the form of a coil then the amount of current flowing will be reduced and further if the wire be wound on a laminated iron core the amount of current flowing will be very greatly reduced, in fact there may be practically no current being forced through at all if the conditions are just right.

You might say here that an alternating current is not governed by Ohm's Law because you know the resistance of the wire has not been increased. Alternating currents are governed by Ohm's Law, however, but a peculiar condition comes into play in this case, which I will try to explain, and upon this governing condition depends almost all the effective value of alternating currents.

On account of self-induction, either an increase or decrease of current in a coil is retarded by the magnetic effect of the different turns of the coil tending to stop any change in the current. There is practically no effect of self-induction in a wire when it is laid out straight, but when coiled up then the law makes itself known to a certain degree, because the magnetic effect of each turn of wire is acting on each other turn. This effect is magnified to a large degree when the wire is wound on an iron core, because the iron largely increases the magnetic effect of the turns and consequently increases the self-induction of the coil.

If a direct current be applied to send a flow through a straight wire, the current will rise to its full value almost instantly, that is, to the amount of flow governed by Ohm's Law. When the same wire is coiled up and connected to the same direct pressure, the current will not reach its full value so quickly on account of the retarding effect of self-induction. Now if the same wire be wound on an iron core the current will not reach its full value for quite an appreciable period of time, because the self-induction has so much greater retarding effect on account of the added influence of the iron.

Although it takes the current longer to reach its maximum value in this case than if the wire were laid out straight, yet when it does the amount of flow will be just the same. After it has reached that point the self-induction has no retarding effect, or in fact does not then effect the current at all, because self-induction can only have an effect when a current is changing in value.

An alternating current is continually changing its value so the self-induction will be acting upon it all the time. While the current is tending to increase in value, the law of self-induction is holding it back and when the current is falling or decreasing in value, the tendency of the self-induction is to keep it from changing. The result is that in a circuit that has self-induction, an alternating current will always be retarded, which causes the maximum value of the current to be smaller than it would be provided there was no such effect.

The effect of self-induction in decreasing the amount of alternating current which flows in a circuit depends upon the magnetic effect which the circuit has upon itself and also on the rate of alternations of the current. You can readily see why the alternations must necessarily be quite rapid, for if the electric pressure be kept long enough in one direction the flow

would reach its full value the same as with a direct current, that is, by continuing the pressure long enough in each direction the retarding effect would be overcome.

Then the resistance of a circuit to an alternating current must be equal to the dead resistance of the wire plus the effect of the self-induction. The dead resistance of the wire depends only upon its length, cross section, and the material of which it is made, while the self-induction depends upon the magnetic effect which the circuit exerts upon itself, and also upon the frequency of the current.

Alternating currents are very much used for the distribution of electricity for the purpose of electric lighting, because by this means a high voltage can be maintained on a feeding circuit and reduced by the use of transformers at any convenient point where lights are to be used.

The fact of being able to use a high voltage permits of currents being sent quite a distance from the source of generating and at a small loss in efficiency; also considerable power may be sent over small copper carrying capacity, thus saving considerable in the expense of constructing a plant.

Article No. 15, will be entitled "Transformers."

THE BARMEN-ELBERFELD SUSPENDED RAILWAY.*

In the presence of a notable company, including the Imperial State Secretary and the Prussian Ministers concerned, and many leading men in commerce and industry, the Suspended Railway of Barmen-Elberfeld was opened on Wednesday, October 24. The cars are suspended, after the manner of a bucket on a wire rope-way, from a single rail mounted overhead upon an iron framework. The railway is 9.37 miles long, and there are twenty stations. It begins at the Barmen-Rittershausen Railway Station, and goes through the towns of Barmen and Elberfeld, following the course of the Wupper, as was inevitable, owing to the many houses and the narrowness of the valley. Just beyond Elberfeld it leaves the river and follows the road through Sonnborn to Vohwinkel, where it ends near the railway station there. At present the Elberfeld portion is working; the Elberfeld-Vohwinkel section will be finished in the winter, and the Barmen portion in 1902. The railway follows the fall of the river, and rises in accordance with the somewhat steep ascent of the road from Elberfeld to Vohwinkel. There will be 17 stopping places altogether, four in the Barmen part, eleven in the Elberfeld part, and two in the Vohwinkel part, the distance between them varying from 300 to 330 yards. The lower edge of the carriages is always at least 14 feet 9 inches above the level of the road, and 11 feet 6 inches below the rail, which is therefore 26 feet 6 inches in the air.

The two lines, the up and the down, have only one rail each, which is supported by an iron framework, consisting of a series of iron girders sustained by supports. These supports are far apart along the river, and are fastened in the river walls for an abutment, as piles cannot be sunk in the loose river-bed. Along the road the supports are arches of sheet iron resting on plaster abutments. The peculiar form of these supports excluded the use of any other metal than iron.

At each of the termini the up and down

*From the "Tramway and Railway World," London.

lines are connected with each other to allow of a continual quick succession of trains. As some of the trains only run between Barmen and Elberfeld, and do not go on to Vohwinkel, a similar contrivance has been constructed at the last Elberfeld Station, the Zoological Gardens. There is also a temporary one at the Kluse-Bembergstrasse stopping place, as the whole Barmen section is not yet finished.

The carriages depend from the fixed over-

front of the first carriage. An electric brake and a through action pneumatic brake, as well as hand brakes, are provided, and these can be set working from different parts of the train. A conductor wire is attached to the iron support of the rail, from which the current is taken. The current is supplied by the newly-built electric works at Elberfeld, and it has a mean tension of 580 volts. The carriages are lit by clusters of

on the picturesque banks of the Schlei, not far from Hamburg, and at the entrance to the bay of Kappeln on the Baltic. A special windmill to test the new idea has been constructed by Herr C. P. Neumann, of Wittkiel. This has a diameter of 39 feet, with a wind surface of 326 square feet. It can develop 30 horse-power, with a speed of 10 revolutions a minute. It drives a dynamo which, running at a speed of 700 revolutions, furnishes a current of 120 amperes at 160 volts. The electrical output attains its normal value when the speed of the wind exceeds 9 feet per second. The dynamo is also employed to charge the accumulators which furnish a current of 110 volts used in lighting the town and in driving several small motors. The experiment having proved extremely satisfactory, a larger installation comprising several windmills and dynamos is under consideration, and we may again possibly see the mill forming a prominent feature of our own landscapes as in former years, though its purpose may be slightly different.

A METER FOR ALTERNATING CURRENTS.*

A meter for recording watt-hours in alternating current lighting circuits, characterized by great simplicity of construction and cheapness, has recently been introduced by the Allgemeine Elektrizitäts Gesellschaft, of Berlin. It is alleged that by the introduction of this invention the meter rent paid by consumers will be reduced to one-half its present amount.

The meter consists of a revolving disk, *A*, which is subjected to the action of two alternating magnetic fields differing in phase, which, owing to their special arrangement, impress a comparatively large driving force on the disk. The magnetic circuit is closed. The pressure bobbins, *s*₁ *s*₂, as well as the main current bobbin, *H*, are placed at one side of the disk, the three cores of the bobbins being connected to a single yoke, *x* (Fig. 1), and

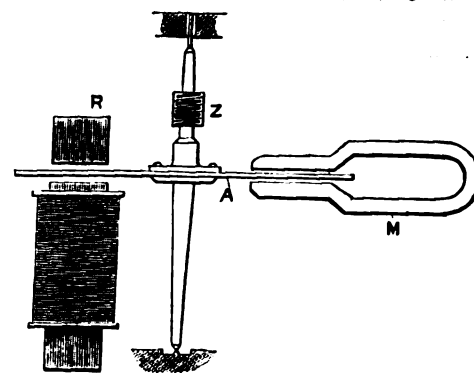


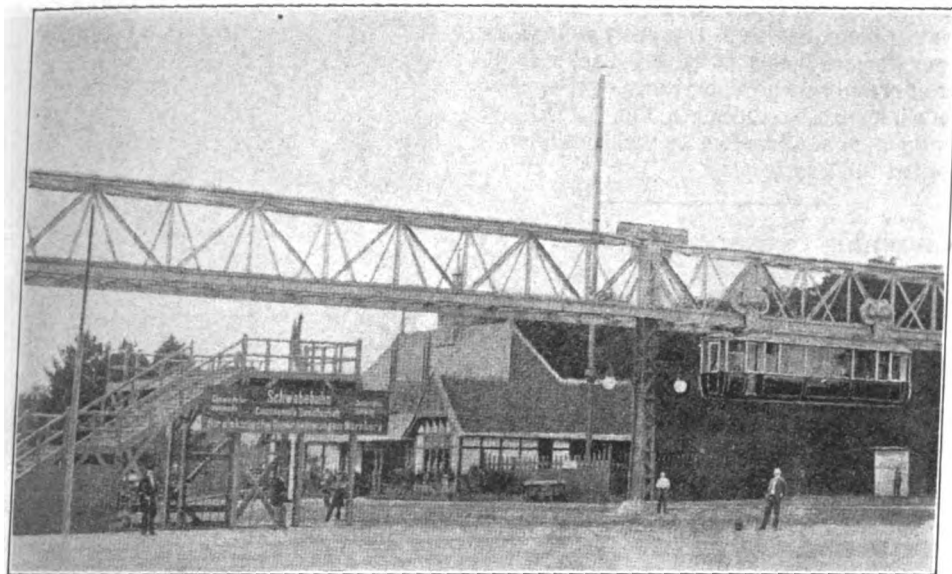
FIG. 1.

the magnetic circuit completed by a single armature, *R*.

The operation of the meter is as follows: The two shunt bobbins, *s*₁ *s*₂, impart alone (without the main current) a fairly strong turning moment to the disk, either when the air spaces, *L*₁ *L*₂, of the two pressure cores are unequal, or when the magnetic force of the two pressure bobbins is different.

This turning moment would cause the meter to run when no current was flowing, and it must be reduced to an amount which is just sufficient to overcome the friction of the apparatus. This can be done by varying the number of turns or the air space; in the actual in-

*From the "Electrical Review," London.



SUSPENDED RAILWAY AT THE PARIS EXHIBITION (VINCENNES ANNEX).

head rail by means of two bogies, each of which is supplied with two wheels, and are at a distance of 26 feet 6 inches. By this means the carriages can easily pass sharp curves, as they hang freely, and can swing out to a considerable inclination sideways—15 degrees is allowed on the Elberfeld Railway. On account

small lamps contained in a large globe in the roof.

The cars will travel at a speed of 18.6 miles per hour, but it is stated that a much higher speed can be attained.

The constructors of the line, the "Continental Gesellschaft für Elektrische Unternehmungen," Nuremberg, made an exhibit at the Paris Exhibition, in the Annexe de Vincennes, of which we reproduce a photograph. The track was 200 feet long, and consisted of two bridges of 100 feet each, resting on three pillars. The bridges and car will be used again on the railway at Barmen. The track was in working order, but the company discontinued running the car on account of the shortness of the line, which gave no opportunity for showing the advantages claimed for the system. The constructors of the line have sent us two reports of a well-known expert on railways, Prof. Dolezalek, of Hanover, who is convinced there is a great future in store for the suspended railway. The professor recommends its adoption on the existing railways, as an overhead express service on which, according to the traffic, any number of carriages can be dispatched, traveling at a high rate of speed and subject to no interruptions, while the slow ordinary traffic may go on underneath.

Windmills and Electricity.

Windmills—except in Holland—have almost entirely gone out of favor for their original purpose, namely that of grinding corn, and are indeed but sparsely used even for pumping water, says the "Tramway and Railway World." They may, however, be more largely patronized in the future. It has been suggested that they might be employed in the production of electricity, and experiments having this for their object have just been made at Wittkiel, a little German village near Kappeln



INTERIOR OF CAR—BARMEN-ELBERFELD RAILWAY.

of the curves of the Wupper, curves of a radius of 297 ft. were requisite. The firm parts of the bogies, from which the carriages hang, are connected so closely with the iron support of the rail that it is impossible for the carriage to get off the line, even if the tire of a wheel or an axle breaks. An electric motor is attached to the upper part of the bogie, which drives the two wheels equally. All the motors of a train are managed by a driver in the

strument the latter is made adjustable. If the main current is now turned on, a mutual action takes place between the magnetic field of the main current and the vortex currents generated in the disk by the shunt bobbins on the one hand, and between the magnetic fields of the shunt bobbins and the vortex currents generated by the main current bobbin on the

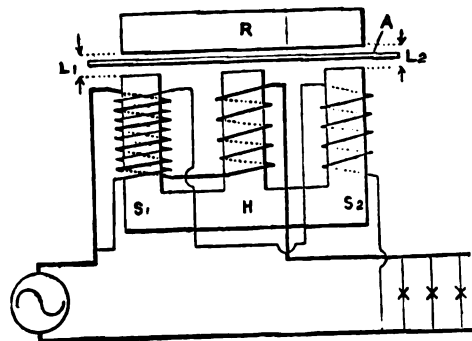


FIG. 2.

other hand. The result is that the disk A is set in rotation.

The field of the main current bobbin acts upon the fields of the shunt bobbins so as to reduce one and increase the other, as shown in Fig. 4. The core of one of these bobbins would thus reach saturation point much sooner than that of the other, and the proportionality

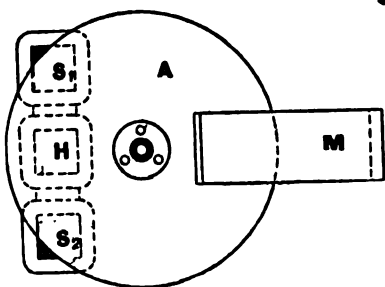


FIG. 3.

would be disturbed. To prevent this, a part of the main current circuit is wound about one of the shunt cores, as shown in Fig. 2, to compensate for this inequality in the field. If the same effect were produced by winding different numbers of turns on the two shunt bobbins,

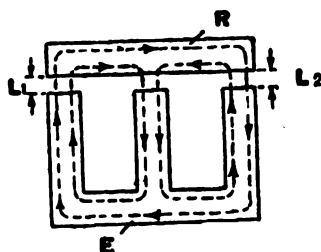


FIG. 4.

then, as stated above, the meter would run when the main current was not turned on, which is an insuperable objection to this method of compensation.

The speed of rotation imparted to the disk

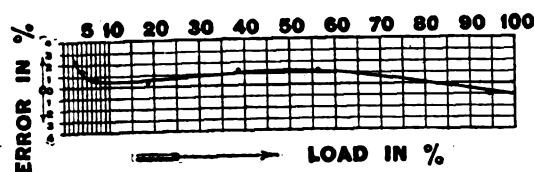


FIG. 5.

in this way is directly proportional to the product of the current and the pressure. The apparatus, therefore, counts the number of watt-hours. The magnet, M, acts as a brake

to the disk. The rotations of the disk are transmitted to a counting mechanism, in the simplest way, by worm gear. The reading of the meter is in kilowatt-hours, and is shown in a single row of figures on the face of the counting mechanism, so that the consumer can at any moment, without trouble, read off the number of units which he has consumed, i.e., how much he owes to the electric supply company. No reduction of the reading is necessary, since the instrument is constructed so that the constant is always unity. The instrument, if properly set up, retains its original accuracy for any length of time. The percentage of error over the whole range of the instrument is shown by the curve, Fig. 5. It is evidently of some advantage to the consumer to work at full load.

A DOUBLE CURRENT POWER PLANT.

BY FRANK C. PERKINS.

It is frequently found necessary in the distribution of current for railway, light and power work, to supply both direct current and alternating current from the same power station. In many cases this is accomplished by using a combination in the same power house of both continuous current generators and polyphase alternating current machines, each directly connected to its own prime mover, whether turbine or steam engine. The direct current is usually utilized for local distribution for lighting or street railway work, while

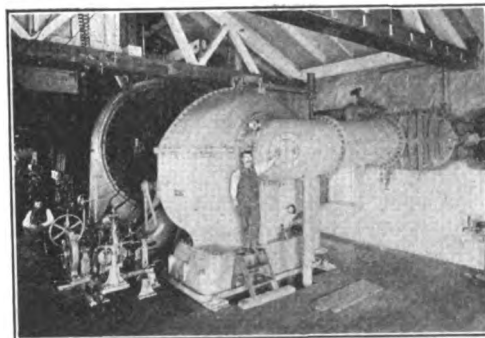


FIG. 1.

Alternating Current Side Double Current Generator at Montmorency Falls.

the alternating current is raised in potential to 5,000 or 10,000 volts and transmitted over considerable distances. The current is then transformed down to moderate potentials, and used either directly as an alternating current for operating stationary polyphase motors as well as lights, or is transformed by rotary converters at those points to a direct current for use on railway feeder circuits.

In other cases only polyphase alternating current apparatus is installed in the power station, and the direct current necessary is supplied not only at distant points by rotary converters, but also by the use of the same class of apparatus located near or in the power station. An example of such an installation is located at Niagara Falls, where the main power house is supplied only with alternating current generators, the local direct current railway circuits being supplied by rotary converters in the main generator room of the Niagara Falls power house, while the railway feeders, ten or twenty miles away on the Buffalo & Niagara Falls Electric Railway Line are supplied from sub-stations at Tonawanda and

Buffalo, each sub-station being equipped with static step-down transformers and rotary converters for supplying the feeders at those points.

In some other cases, similar to the one about to be described, double current generators are installed in the main power house, arranged to supply both polyphase alternating currents

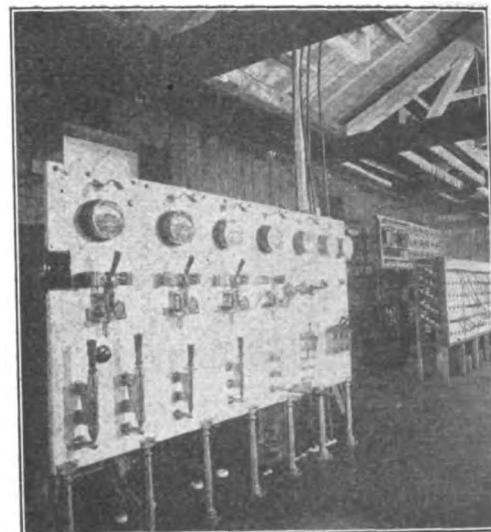


FIG. 2.—MONTMORENCY SWITCHBOARDS.

and 110 or 550 volt direct current from the same machine. The neighboring lighting circuits and the railway feeder circuits near the power house are then supplied directly through the switchboards from the commutator of the direct current side of the double current generator, while the distant points are supplied with a polyphase current from the brushes and slip rings on the alternating current side of the same machine.

A Westinghouse double current generator of this type is shown in Fig. 1, directly connected to a Victor turbine wheel at the power house of the Quebec Railway, Light & Power Company at Montmorency Falls, Can. This generator is a 600 kilowatt machine, and supplies a 500 volt continuous current to the local railway

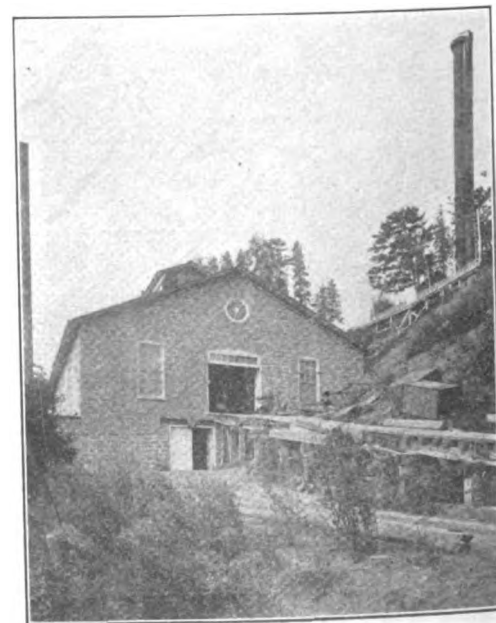


FIG. 3.

Exterior of Power House Quebec Railway, Light & Power Co.

feeders from the direct current side, and a 400 volt two phase current from the alternating side, shown in Fig. 1. The frequency of this

current is 66 cycles per second, the armature having a speed of 286 revolutions per minute. This generator is directly connected to a 54 inch Victor turbine which develops 1,000 horse power at an available head of about 200 feet. The turbines and governors were installed by the Stilwell-Bierce & Smith-Vaile Company. The switchboards seen in the accompanying illustration, Fig. 2, are equipped with circuit breakers, and the many measuring instruments required in the power house for the various circuits.

The two phase alternating current, after passing the switchboard from the double cur-

rent machine is increased in potential by static step-up transformers to 11,000 volts, and is conducted to a sub-station more than a dozen miles away at St. Anne's de Beaupre, where rotary converters are employed for changing the two phase alternating current to a direct current for supplying the railway feeders at those points.

ernor will shut down to a normal speed, and keep it there until the operator can close down the water wheel by hand or by power.

The induction alternators supplied by the

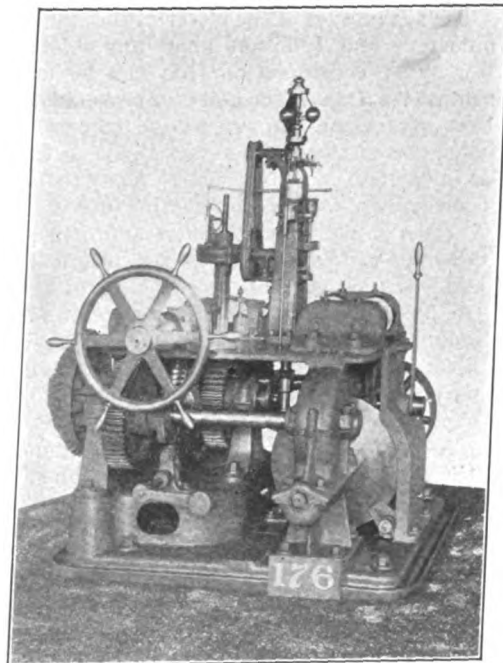


FIG. 5.—GEISSLER ELECTRO-MAGNETIC GOVERNOR.

Royal Electrical Company of Montreal may be seen in the background in illustration Fig. 1. It is considered by some engineers an entirely useless proceeding to install double current generators when rotary converters have been

brought to such a state of perfection as to supply the necessary direct current with so little inconvenience and expense. It will therefore be interesting to note any new additions which may be made from time to time to this class of apparatus in plants now in process of construction or under consideration.

The double current machine is undoubtedly used to good advantage when a direct current is necessary for low voltage lighting in the locality of the power station, and when alternating currents are required for supplying current to suburban points, while this method will also no doubt have many adherents where local street railway and suburban feeders must be supplied from a single station.

Z. T. GRAMME.*

BY SILVANUS P. THOMPSON.

By the death of M. Zénobe Théophile Gramme, the electrical world loses one of the pioneers to whom the vast developments of the past quarter of a century are largely due.

Born in Belgium, in 1828, he was brought up as a carpenter, but he early manifested a talent for machinery, which was developed by attendance at some scientific lectures at Liège.

It will be remembered how, following the scientific discoveries of Faraday, the production of electric light by the arc became gradually practicable. In England Staithe, and in France Foucault, devised mechanism for automatically regulating the carbon pencils. The primitive magneto electric generators of Nollet in France, and of Holmes in England, gave promise of success. Faraday himself lived to see Holmes' giant machine in the Great Exhibition of 1864, and reported that at last electric light might with safety be applied to lighthouses. In France the "Alliance" machine, constructed by able engineers on the basis of the older designs of Nollet, was also intended for lighthouse illumination. To Paris, and to the "Alliance" factory came Gramme as a simple fitter; with no technical training in electricity, he acquired a practical grasp of the properties of electric currents that led him to suggest valuable improvements. He worked also in the workshops of Rhumkorff where doubtless he gained an insight, not to be attained at that date in any other way, into the mysteries of making that perfect mechanical insulation so essential in the induction coil.

It was in the sixties, while Gramme was thus working his way upward in Paris, that other improvements were being made in generating machinery in other parts of the world. Pacinotti, then a mere student, now still professor, in the University of Pisa had made and described his magneto-electric machine having a toothed-ring armature. But Pacinotti's ring fell still-born, and his machine was relegated, unheeded though meritorious, to the shelves of the museum. In England, Wilde had broken new ground by showing how, from the minimum of current the most powerful currents could be mechanically generated, by using that minimum to exalt the magnetism of field-magnets of soft iron; and by this principle of multiplication he led up to the so-called self-exciting machines of 1866 and 1867. It is a bare matter of history that the name "dynamo-electric machine" was first applied to the

*From the "Electrician," London.



FIG. 4.—MONTMORENCY FALLS.

The power house shown in the illustration, Fig. 3, is 150 feet long and 40 feet wide. It is a stone structure and is equipped with five turbines in all, each having a capacity of 1,000 horse power, and each directly connected to a single generator. In addition to the double current machine above mentioned there are in operation four Stanley two phase alternators of the inductor type, generating currents of 5,000 volts, and having a frequency of 66 cycles per second. These machines have capacities of 600 kw. and 700 kw. The turbines are operated by water from the Montmorency Falls, shown in illustration Fig. 4; the total drop from the falls is about 275 feet before reaching the St. Lawrence River while the available head at the power house is about 200 feet.

The speed regulation of the turbines in this plant is secured by the use of Geissler water wheel governors, one type of which is noted in Fig. 5. The variation is said to be kept within ten revolutions under the heaviest changes of load, while ordinary variations of load do not affect the speed to exceed five revolutions. The mechanism used for turning the water wheel gate shaft consists of two worms and worm gears, a double ended flat friction plate and a set of epicyclic gearing. The worm gears are said to reduce the noise to a minimum while the face frictions are employed to start and

machine of Wilde, and then to the self-acting forms.

Wilde was himself assiduously developing various types for industrial purposes, when, in 1870, Gramme appeared upon the scene with the simple, uniformly-wound ring armature with which his name will ever be associated. His English patent has a curious history. It may appear strange that so important an invention should have been protected by so slight a specification—a few lines of description, a single claim, unaccompanied by any drawing; that constitutes the whole of the patent of Gramme and d'Ivernois. The simple fact is that at the date when the filing of the final specification became due Paris was besieged, and it was impossible to send drawings to the London agent, who simply filed the materials that were to hand. The rapid commercial success of Gramme's machine is due to a combination of causes. It was the first practical machine in which were combined the features of the continuity of commutation, the self-exciting arrangement, good lamination in the armature core, and reasonably good proportions in the magnetic circuit. No doubt, also, Gramme was fortunate in having behind him a good firm of mechanical engineers to undertake the construction of his machines. Be that as it may, there is no question that the "Machine Gramme, Type A" conquered the industrial world, and gave to its inventor a reputation which British engineers would be the last to belittle.

It is not, moreover, without significance that a good deal of Gramme's success is due to that which at the present day English manufacturers are too prone to decry—the publicity gained in international exhibitions. At Vienna in 1873, at Philadelphia in 1876, and notably at Paris in 1878 Gramme's machines were in evidence. It is said that the Gramme machines at Philadelphia incited the invention of the Brush and of the Thomson-Houston machines for arc lighting. It is certain that the Jablochkoff method of arc lighting, which was a feature of the Paris Exhibition of 1878, was largely made successful by the co-operation of Gramme in designing suitable generators to meet the new requirements. In the Electrical Exhibition at Paris in 1881 Gramme was again to the front with a most interesting series of varied designs, showing in how many directions he had worked at improvements. His ideas seemed to be instinctive. He could not calculate either the sizes of the parts or the numbers of windings. Precise rules were, as we all know, of later origin. But he had that eye for proportion that marks the intuitive engineer. It is related by M. Mascart how, in the Paris Exhibition of 1889, he walked through the machinery hall with M. Gramme to hear the old man's criticisms upon the different forms of dynamo. "There is too much iron," he would remark of one. "There is not enough iron," he would say of another. Before one machine he stopped in admiration, and then whispered: "C'est la perfection." It was the 320 hp. four-pole machine designed by Mr. C. E. L. Brown for the Oerlikon Company.

Gramme took for some years an active part in the industrial operations of the Société Gramme, which flourishes under the direction of M. Hippolyte Fontaine, but in recent years his connection had been little more than nominal. He lived quietly apart on his small property at Bois de Colombes, outside Paris. The writer remembers seeing the then iron-grey,

sturdy little man at the exhibition of 1881, but had never been able to meet him since.

In March, 1897, Gramme was made a knight commander of the Order of Leopold and on this occasion a banquet in his honor was given in Brussels. Two delegates from the Institution of Electrical Engineers—Prof. Ayrton and the present writer—were appointed to join in the celebration to convey the congratulations of their English brethren. The weather, however, was so stormy that cross-channel communication was stopped; and the English delegates had to content themselves with sending telegrams. It is satisfactory to know, however, that "Papa Gramme," as he was affectionately styled, had a splendid reception. A gold medal, recording the event, was struck to commemorate the signal services which Gramme had rendered to the electrical community, and this was presented by M. Mascart in an elegant speech.

Gramme also patented a form of battery, and designed several types of arc lamp. One of these had a breakwheel gear not unlike that of the later Brockie-Pell lamp.

Beside the Belgian decoration above-mentioned, Gramme was an officer of the Legion of Honor, and a chevalier of the Order of the Iron Crown of Austria. It is an open secret that his name had already been put forward at the council of the Institution of Electrical Engineers to be proposed for election as an honorary member. Alas, that is no longer possible. He died quietly at his home on January 20, in his 75th year, and was buried in the cemetery of Père Lachaise, Paris, on the 23rd inst.

THE ELECTRIC HEADLIGHT.

The Burlington & Missouri Railway in Nebraska is equipping its passenger locomotives with electric headlights, concerning the service of which T. E. Calvert, general superintendent, in an interview in the "Omaha Bee," remarks as follows:

The advantages of the electric headlight are numerous and I do not know any objection worthy of consideration that can be urged against it. One of the chief improvements is that enginemen can see switch targets and other obstructions on the track almost as easily as in daylight and far enough away to bring their train to a stop before getting into trouble. Another thing is that farmers and others on crossings will be warned by the bright light and fewer people will be run into by trains. On dark, foggy nights the reflection shows around curves and prevents head-end collisions. Electricity is so much better for headlighting purposes than acetylene that we have stopped experimenting with the latter altogether.

As an indication of the great brilliancy of the electric headlight, the first night an engine equipped with one for experimental purposes was on the road the agent at Grafton saw what appeared to be either a comet or a train. He knew that no train was due at that time and was considerably exercised. He telegraphed the dispatcher to know what train was coming in ahead of No. 3 and said it was even then in the east end of the Grafton yard. The dispatcher was himself perturbed until it dawned upon him that the new electric headlight was probably the solution of what seemed a serious problem. It turned out that the bright light which the Grafton agent saw was the electric headlight on No. 3, which was then in the Fairmont yards, seven miles away.

Another similar incident occurred on the first night. At Otis a freight train pulled into a siding to get out of the way of No. 3, when No. 3 was twenty miles away. The conductor saw the headlight bearing down upon him and there was some rapid hustling to get out of the way, the conductor thinking that the train was right on them. He waited twenty-six minutes for No. 3 to pass him after he had gotten safely in the clear, and No. 3 all this time was coming right along.

PAN-AMERICAN EXPOSITION-CITY TAKING ON BEAUTY.

BY ELBERT L. LEWIN.

Favorable weather, interrupted only occasionally by a bad day or two, has permitted of rapid progress of the work on the buildings and grounds of the Pan-American Exposition. All of the twenty or more larger buildings are now entirely enclosed. Some are practically completed and others are lacking only a comparatively little amount of work to bring them to a similar point. A few days more and the exteriors will be completely covered with staff and awaiting only the application of color and placing of sculpture to complete their external beauty. The wiring and placing of lamps for the electric illumination keeps pace with the structural work. Grading is in progress, walks are being laid, and ornamental work is being done in the courts, along the canals and on the terraces.

The work is so well advanced as to give visitors to the grounds a foretaste of what is to be when the Exposition gates are thrown open to the public on the first of May. The question, "Will it be ready?" which was frequently asked earlier in the progress of the work, is no longer heard. The appearance of things is an emphatic answer in the affirmative.

It is estimated that nearly a million people have visited the grounds since the beginning of the work of construction. On different Sundays more than 20,000 have passed through the gates.

About 3,000 men are employed in the building of the Exposition and there will be a large addition to the force early in the spring, when the necessities demand it.

Up to the present there has been used in the construction 26,570,000 feet of lumber and 6,242,000 pounds of steel and iron including bolts and washers. The amount of surface covered with staff is 17,765,000 square feet. The excavation has been for the fountains and sunken gardens, principally, approximately 150,000 cubic yards of earth having been removed.

In building the Exposition City the sum of \$10,000,000 is being expended. The Midway alone will cost \$3,000,000.

The Pan-American will not be as big as some former Expositions, but it will be more beautiful than any of them. The Exposition site is a commanding one, containing 350 acres adjoining Buffalo's lovely and expansive Delaware Park. In selecting the Spanish Renaissance style of architecture as a basis for the Exposition architects to work upon, the managers paid a compliment to the Latin-American countries, and at the same time provided for an effect of surpassing grandeur. The style has been somewhat modernized in its treatment, with the result of enhanced beauty. Color is judiciously applied to relieve the staff-covered structures of the blank monotony which has characterized former exposition cities. It is

rich, charming, restful to the eye—the very perfection of color decoration of buildings. The prismatic splendor has evoked the term "Rainbow City" for the ensemble of Exposition palaces. Sculpture will add to the attractiveness. Majestic statues and costly groups will adorn domes and towers and guard the entrances to buildings. There will be more than 125 groups of statuary in the Exposition City, the work of the best sculptors of the country under the direction of Karl Bitter.

The court settings will be superb. The principal courts are the Court of Fountains and Plaza which form a north and south perpendicular and connect with a transverse court called the Esplanade. In all the courts will be large pools rippling and sparkling under the fantastic activity of numberless fountains. Many of these fountains are to be elaborate sculptured works with jets of water playing from hundreds of openings.

Surrounding the main group of buildings and bordered with a double row of trees and grassy banks, is a broad and stately canal more than a mile in length.

In perfect harmony with the grandeur and beauty of the buildings and courts will be the horticultural and floral embellishments of the grounds.

Rising high above all the other structures on the Exposition grounds the Electric Tower is the first object to arrest the attention of visitors. It is 391 feet high. The base is 80 feet square to a height of 200 feet. This base is flanked on the east and west sides by colonnades, 75 feet in height, semi-circular in form, which curve toward the south, forming a clasp setting for the great basin of the Electrical Fountains. From the fountains of the Goddess of Light at the apex, the Tower will be one mass of quiet beauty by day and of fiery, sparkling grandeur by night. Elevators will take visitors to the restaurants upon the colonnade, where they will have a commanding view of the broad and beautiful Court of Fountains.

The electrical display will be far superior to any yet attempted.

These are the principal features which will excel all former attempts of the kind and serve to make the Pan-American Exposition City the most beautiful spectacle ever prepared by the genius of man for a similar enterprise. It will be a picture that will delight and satisfy, and linger long in the memory.

The Pan-American Exposition concerns itself with the progress of the countries of the Western Hemisphere and the new possessions of the United States. To show the achievements during the century just closed and make far more rapid progress in the future is the chief purpose. In order to realize the ideal in mind the various countries, commercially and socially. The golden opportunity comes with this Exposition, when the representative men of all the countries in question will be gathered together and the diversified resources of the Continent displayed. Such an international congress of people, exhibits and ideas, must needs develop much of good for the inhabitants of the Continent and posterity. It offers the chance for better acquaintance, the acquirement of new and useful knowledge, a comprehension of each others' opportunities and necessities, the settlement of questions which have too long retarded international trade in Pan-America, and the laying of a strong and enduring foundation for an intercourse which will be mutually beneficial.

The Pan-American Exposition has the cordial endorsement of the United States Government, which has appropriated \$500,000 for an exhibit.

The Government is erecting three handsome buildings for its exhibit. The main building is 130 feet wide and 600 feet long. The others are each 150 feet square. The architecture is a free treatment of the Spanish Renaissance, the details suggesting a Mexican rather than a strictly Spanish origin. Like the other Exposition buildings, they are being covered with staff and tinted and gilded, giving the intricate plastic decorations and sculptor groups an ensemble both striking and interesting. Red Spanish tiles on the roof add to the beauty.

The space for the Government exhibits is but little less than was used at the Chicago Exhibition. Of particular interest will be the Government's big gun exhibit—a group of three immense pieces of ordnance being mounted immediately at the north of the main Government building. One of these is the 12 inch gun with disappearing carriage, so arranged that neither the gun nor gunner is exposed during the moment of firing, the recoil causing their disappearance. Another is the 16 inch sea-coast half-mast rifle, the most powerful piece of ordnance ever constructed in the United States, having a maximum range of 20½ miles.

The States of the Union, the Dominion of Canada, Central and South American countries and the Islands of the West Indies will be represented officially and by individual exhibitors. New York State's appropriation for an exhibit is \$300,000. Its building will be permanent. It is constructed of white marble, and the style of architecture is that of a Doric Temple.

The amusement feature is far superior to any former one in connection with an exposition. The Midway attractions are the pick of hundreds offered.

There are more than 40,000,000 people living within a night's ride of the Pan-American Exposition, and a great attendance, possibly exceeding that at the Columbian Exposition, is confidently expected. The hopes of the managers are for more than 25,000,000 paid admissions.

Submarine and Submersible Boats.

In the "Moniteur de la Flotte," M. Rousseau devotes an article to submarine and submersible boats in relation to the recent trials at Cherbourg. He says that the trials did not throw any new light upon these engines of war, but that they had the merit of bringing the two types of boats into direct comparison, and that the opinion of officers who had been in command of them was unanimous. They all indicated their preference for the submarine boat properly so-called, having evidently some distrust of the submersible. M. Rousseau, however, points out that the Morse represents a type of boat more or less established, and that the submersible Narval is of a new class altogether. He remarks that the trials must not be interrupted of a type of boat which will have the advantage of being offensive. He has been on board the Morse, and says that she navigates with perfect ease below water, that those in her are able to discern by means of the periscope what is going on upon the surface, and that torpedoes are discharged with an accuracy and certainty which might be the envy of officers of ordinary torpedo boats. It appears that the periscope can be employed up to a depth of

about 20 feet below the surface, and, according to M. Rousseau, it is quite adequate to prevent collisions, and being turned round, enables those below to scan the whole horizon.

It has been suggested that the instrument would be valueless except in smooth water, but the writer cited asserts that during the Cherbourg experiments the sea was very rough and that the appliance gave, nevertheless, a very clear view. At a greater depth than 20 ft. the course of the Morse is directed by the compass. The plunge is effected by suppressing her flotability by admitting water into special chambers, and there is equilibrium so that the descent is made in the horizontal position, and the required level is maintained by lateral wings or rudders, to the movement of which the boat is very sensitive. The class of boat thus described is available purely for local defences, but the Narval, the system of which is described by M. Rousseau, could be employed in offensive operations. He says that the advantages of the submersible system would be incontestable, but that certain problems have arisen of which the solution has not yet been altogether realized. Larger water chambers and more powerful pumps are required for the plunging and raising of the boat. The steam not used during the surface navigation must be condensed.

These difficulties, combined with the necessity of coupling the electric mechanism with the driving apparatus, make it impossible to plunge the boat within less than 17 or 18 minutes. The period will be reduced to 10 minutes in the Silure, Triton, Sirene, and Espadon, but it will still be too long, and in an actual encounter would leave the boat helpless before her adversary. The belief of M. Rousseau, however, is that the type of the submersible is perfectible, and that the difficulties will be overcome.—"Engineering," London.

The Universality of Electrical Generation.

One of the lessons to be learned from the various methods for generating electricity, and the constant manner in which it persists in putting in an appearance, is the fact, so often overlooked, of its almost universal generation. There is hardly an operation which takes place, in the process of which electricity is not generated in some form or other. A belt running over a pulley—say, driving a dynamo or any other machine—generates electricity as well as heat and sound. In dry and dusty factories, as is well known, sparks of considerable magnitude may often be taken either from the pulley or the belt. All this reduces the efficiency of the transmission, or distribution plant. Every flap of the belt, every unit of electricity, every unit of heat, and every unit of sound generated by a moving belt has to be provided by the driving apparatus, over and above the energy required to drive the machine it is turning, whatever that may be; therefore everything that can be done to reduce these generations, these losses as they are with reference to the work in hand, increases the efficiency of the plant and reduces the coal bill and other working costs.—"Colliery Guardian," London.

Mr. R. L. O'Neill, who has traveled much in Mexico, states that there is a rapidly growing demand in that country for electrical machinery, electrical supplies and electrical mining implements manufactured in the United States.

CANADIAN NOTES.

(From our Ottawa Correspondent.)

The invasion of the horseless vehicle is spreading in Canada. The recently organized Electric Cab Company of Toronto will have cabs and tourist brakes on the streets of Toronto as soon as they can be turned out of the factory. The company now proposes to extend its business to Ottawa and other large Canadian cities. At a meeting of the stockholders, a few days ago, it was decided to double the capital of the company and go into wider fields of operation.

Another large electric company is being formed at Ottawa, provided a charter can be obtained from the city council. Mr. J. W. McRae, late managing director of the Ottawa Electric Company, is the chief promoter of the scheme. The new company is to be called the Consumers' Electric Company, and by its charter will have the power to carry on its business in Ottawa and elsewhere, for the purpose of producing and supplying electric current for electric light, heat and power.

At the next session of the Quebec Legislature a number of Montreal citizens will make application to establish an electric plant near Riviere des Prairies, in Quebec Province. A survey has already been made, and the new company proposes to supply electric energy for heat, light and power purposes to towns within its sphere of operations.

It is announced that by July 1, 1903, the city of Toronto will be fully supplied with electric power generated at Niagara Falls. The Canadian Niagara Car Company, it is stated, will at once begin work on the production of the power. No prior arrangements have been made for the sale of the power in Toronto, and the city authorities will therefore probably be given the first option of handling it. The company has not yet decided whether a line across the country or a cable across Lake Ontario will be used to transmit the energy. This company is the Canadian branch of the big concern that has developed 50,000 horse power on the American side of the falls, and is now adding 30,000 horse power more.

Iowa Electrical Association.

The annual meeting of the Iowa Electrical Association will be held in the club rooms of the Savery Hotel in Des Moines, February 20 and 21, beginning at 10 o'clock A.M. A most interesting meeting is anticipated. Papers have been prepared and will be read upon the following subjects: "An Analysis of the Cost of Supplying Electric Current and the Various Systems of Rates," "The Regulation and Control of Wiring," "Central Station Heating—Mechanically and Financially," "The Renewal of Incandescent Lamps," "The Gasoline Lamp," "Experiences with Mechanical Draft," "Pounds of Coal Required to Produce One Kilowatt Hour," "How Can Delinquent Bills Be Prevented Without a Net Loss of Business," "The Massachusetts Laws." The officers are: President, W. J. Greene, Cedar Rapids; vice-president, H. H. Caughlan, Ottumwa; treasurer, George S. Carson, Iowa City; secretary, W. B. Keffer, Des Moines; executive committee: W. J. Greene, H. H. Caughlan, W. B. Keffer, W. S. Porter and A. Edgecomb.

U. S. Engineer Office, 537 Congress St.
Portland, Me., Feb. 6, 1901.

SEALED PROPOSALS for furnishing and delivering apparatus for electric light plant for Fort Williams, Me., will be received here until 12 M., March 11, 1901, and then publicly opened. Information furnished on application.
S. W. ROESSLER, Maj. Engrs.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended February 6:

Antwerp, 16 cases, \$2,782; 20 packages, \$733; Amsterdam, 1 box, \$15; Argentine Republic, 18 packages auto vehicle parts, \$1,800; 18 packages, \$350; Brazil, 3 packages electric railroad material, \$595; 60 packages, \$5,359; Bremen, 5 cases, \$840; British West Indies, 18 cases, \$227; 1 motor vehicle, \$900; British East Indies, 8 cases, \$442; Brussels, 1 package, \$49; Central America, 136 packages, \$2,379; Chili, 39 packages, \$1,758; Cuba, 211 cases, \$5,048; Dutch East Indies, 19 cases, \$279; Dutch Guiana, 2 cases, \$25; Dutch West Indies, 2 packages, \$25; Ecuador, 1 case, \$23; Genoa, 101 packages, \$12,430; Glasgow, 99 packages, \$34,352; Halifax, 1 case, \$18; Hamburg, 77 packages, \$2,761; Havre, 10 packages, \$985; Hayti, 4 packages, \$158; Hull, 34 cases, \$5,828; Liverpool, 434 cases, \$19,940; 149 packages, \$28,969; London, \$118 packages, \$13,885; 1 case motor vehicles, \$880; Manchester, 66 packages motor trucks, \$3,200; Mexico, 1,147 cases, \$15,547; 35 packages, \$14,950; 3 packages auto vehicles, \$2,000; Milan, 1 case, \$28; Newcastle, 105 cases, \$4,871; Newfoundland, 1 package, \$66; Nova Scotia, 18 packages, \$586; Palermo, 1 case, \$7; Peru, 45 packages, \$658; Ramsgate, 26 packages, \$4,000; Riga, 2 cases, \$306; Rotterdam, 6 cases, \$60; Southampton, 4 packages, \$213; U. S. Colombia, 16 cases, \$289; Venezuela, 55 packages, \$818.

PERSONAL MENTION.

Mr. Julian DuBois, former road master of the Union Railroad of Troy, N. Y., has been appointed to the position of superintendent of the Street Railway and Electric Light and Power Company of Amsterdam, N. Y.

Mr. Frederick E. Judson, of Nashville, Tenn., has been appointed manager of the Knoxville, Tenn., exchange of the Cumberland Telephone Company.

Mr. Hugh J. Collins has been appointed assistant treasurer of the United Traction Company of Albany, N. Y., in place of Joseph G. House who resigned.

Mr. Robert Pond Brown, formerly chief engineer in charge of the electrical equipment of the Brooklyn Heights Railroad Company, died on February 8.

Mr. C. K. Mead, former manager for the Fort Wayne Electric plant, is a candidate for appointment as city electrical inspector of Des Moines, Ia.

INCORPORATIONS.

The Elkhart Electric Company, Elkhart, Ind. Capital stock, \$100,000.

The Electric Railway Equipment Company, Philadelphia, Pa. Capital stock, \$35,000.

The Homer Electric Light & Power Company, Homer, Mich. Capital stock, \$14,000.

The Franklin Electric Company, Davenport, Ia. Capital stock, \$50,000. Incorporators: William H. Cercilius, John Austin and H. M. Howley.

The National Electric Security Company, Peoria, Ill. Capital stock, \$30,000. Incorporators: John H. Bontges, William Donaldson and C. E. Unland.

The Mercantile Electric Company, St. Louis, Mo. Capital stock, \$100,000. Incorporators: Gerard Swope, Isaac Schwab, David Goldsmith, Charles G. Dubois, James W. Johnston and Fred B. Uhrig.

The Leonard & Hall Company, Wallingford, Conn.—to deal in plumbing, steam fitting and electrical supplies. Capital stock, \$2,000. Incorporators: P. J. Leonard, James E. Hall, Rose M. Hall and Nellie F. Leonard.

The Chairman Mining & Electric Company, Denver, Col. Capital stock, \$1,000,000. Incorporators: Lorenzo R. Johnson, M. B. Dunham, Fred Morck, Dix W. Smith, Milan Hibbard, Theron P. Otis, Edward Campbell, B. S. Cushman and J. I. Stanton.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED FEBRUARY 5, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

667,246. Electromagnetic Brake-Shoe. Frank C. Newell, Wilkingsburg, Pa., assignor to the Westinghouse Air Brake Company, Pittsburg, Pa. Filed April 28, 1900.

667,336. Trolley Head. Eli S. Reed, Hill City, Tenn., assignor of one hundred and fifty-three two-hundredths to Edward M. Smith and William P. McClatchey, Chattanooga, Tenn. Filed June 20, 1900.

667,509. Current-Collector for Electric Railways. Frederick C. Esmond, New York, and Norton P. Otis, Yonkers, N. Y. Filed Nov. 17, 1899.

667,571. Trolley-Wire Crossing. James W. Perry, Philadelphia, Pa. Filed May 10, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

667,324. Shade-Holder for Electric Lamps. George M. Lane, Newark, N. J., assignor to M. Samuel Kamm, same place. Filed Sept. 17, 1900.

667,372. Electric-Arc Lamp. Hans O. Swoboda, New York City. Filed June 15, 1900.

667,584. Electric-Arc Lamp. Rupert Scheffbauer, Jersey City, N. J., assignor to the Sterling Arc Lamp Company of New York. Filed May 1, 1900.

667,585. Electric-Arc Lamp. Albert Schweitzer, Pittsburg, Pa. Filed Oct. 6, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

667,375. Electric Motor. George E. Weisenburger, Sharon, Pa., assignor of one third to E. W. Beadel, New Castle, Pa. Filed Feb. 21, 1900.

667,519. Electric Meter. Jesse Harris, Rensselaer, N. Y. Filed June 2, 1900.

667,619. Controller for Electric Motors. Thomas W. Eaton, Chicago, Ill., assignor to the Eaton & Prince Company, same place. Filed Oct. 8, 1900.

667,625. Automatic Electric Circuit-Breaker. Bertram Hopkinson and Ernest Talbot, London, Eng. Filed July 16, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

667,195. Telephone-Switchboard Connection. Thomas V. Davis, Chicago, Ill. Filed April 28, 1900.

667,327. Telephone-Transmitter. Tidolf Lidberg, Chicago, Ill., assignor to the Swedish-American Telephone Company, same place. Filed Oct. 3, 1900.

667,448. Signal for Trunk-Lines. Frank R. McBerty, Downer's Grove, and James L. McQuarrie, Chicago, Ill., assignors to the Western Electric Company, Chicago, Ill. Filed Jan. 11, 1897.

667,460. Telephone-Exchange Apparatus. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Sept. 25, 1896.

667,461. Apparatus for Telephone-Switchboards. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Jan. 9, 1897.

667,462. Signal-Lamp for Telephone Switchboards. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed March 9, 1898.

667,463. Signaling Apparatus for Telephone-Switchboards. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed June 7, 1899.

667,484. Device for Disinfecting Transmitters and Receivers of Telephones. Cyrus F. Axtell, New York City. Filed May 25, 1900.

667,503. Phonograph Attachment for Telephone-Circuits. Allan B. Clark, Nashville, Tenn., assignor of one half to J. Roy Boone, same place. Filed July 10, 1900.

667,546. Telephonic Transmitter. Lemuel Mellett, Somerville, Mass., assignor to Albert F. Henderson, Melrose, Mass. Filed June 14, 1900.

MISCELLANEOUS.

667,366. Lightning-Rod. Ebbe J. Hansen, Atlantic, Iowa. Filed May 22, 1900.

667,374. Electric Heater for Liquids. Joseph A. G. Trudeau, Ottawa, Can. Filed April 4, 1900.

667,421. Means for Connecting Electrodes. Henry Blackman, New York City. Filed June 6, 1899.

667,434. Signaling System. Waldo F. Follett, New Haven, Conn., assignor to the National Electrical Manufacturing Company, Milford, Conn. Filed June 22, 1900.

667,435. Cartridge Fired by Electricity. William Friese-Greene and Percy E. Knell, London, Eng. Filed Dec. 30, 1899.

667,454. Fac-Simile Telegraph. Anton Pollak, Szentes, Austria-Hungary. Filed Feb. 17, 1899.

667,498. Electrolyzer. William T. Chapman, Manchester, Eng., assignor to the American Alkali Company, Philadelphia, Pa. Filed Sept. 12, 1900.

667,567. Conduit for Electric Wires. Emmett D. Page, New York City. Filed May 14, 1900.

DESIGN.

34,040. Incandescent Electric Lamp. Charles A. Chase, Chicago, Ill., assignor to the General Incandescent Lamp Company, Cleveland, O. Filed Jan. 11, 1901. Term of patent 14 years.

THE TELEPHONE WORLD.

Keystone Company to Start Soon.

In Philadelphia, Pa., it was recently stated semi-officially that the work of construction on the Keystone Telephone Company's system would be commenced within three or four weeks and pushed from then on until the company was ready to enter into active competition for business in the local telephone field.

The statement came from C. E. Wilson, general manager of the Keystone. Among other things Mr. Wilson said that a number of expert workmen had been already engaged, and that others were being arranged for. These will be put to work not later than March 1, or earlier if the weather will permit. The plans for the conduits and other important parts of the system have been practically all completed, a force of engineers and draughtsmen having been engaged on them for several months. No contracts for the work of construction had been awarded February 5, but contractors will be asked to submit bids within the next few days.

It is understood that the conduits laid by the Standard Telephone Company and by at least one of the other telephone companies, whose franchises the councils ordered forfeited several months ago, have come into possession of the Keystone, and that they will be utilized in the latter company's system. The matter of rates has not been decided upon by the Keystone's officials, or if it has nothing concerning the prices to be charged patrons of the new company has been permitted to leak out. The Keystone expects to start business with at least 10,000 subscribers.

Alexander Balfour is president of the new company and Congressman Robert H. Foederer a member of the board of directors.

The People's Telephone Company of Clinton, Tenn., is preparing to make some important extensions in the spring, which will reach Harriman, LaFollette, Jellico and intervening points. It will be a three circuit system, or six wires, the purpose being to make it a system first-class in every respect. These extensions will add many miles to the system, as well as some valuable toll stations, and probably some excellent local exchanges.

A meeting was held recently to arrange plans for organizing a local independent telephone company in Hooper, Neb. E. O. Spielberg was elected chairman and J. Howard Heine secretary. A committee was appointed to estimate the cost of the system and report at the next meeting, when articles of incorporation will be made. There have been forty telephones subscribed for and it is the intention of the company to extend lines into the country.

The United Telephone Company, which owns a system of telephone toll lines in Northern Indiana, has purchased the line built along the Cudahy oil pipe line from Bluffton to Kankakee, Ill., through Wabash County. When the Cudahy oil line was sold to the Standard the telephone line became useless to the oil people. It will form a valuable link in the long-distance line to Chicago.

There are within the limits of what the company defines as the Worcester, Mass., Telephone Exchange, which includes many suburban towns, a total of 3,700 subscribers in round numbers. The number of exchanges or central offices in those limits is nine, including Whitinsville, Millville, Princeton, Oxford, Uxbridge, North Oxford, Barre and Jefferson. To connect the many places within the exchange limit 6,000 miles of wire are in use.

Articles have been filed for record changing the name of the Keokuk, Ia., Telephone Company to the Mississippi Valley Telephone Company and increasing the capital stock from \$75,000 to \$100,000.

The Telephone Manufacturing Company of Sumter, S. C., recently shipped a car load of the "Imperial" phones to Havana, Cuba, where the company has established an agency to supply the Cuban and West Indian trade.

The Waseca, Minn., Telephone Company recently reported gross earnings to the State Auditor amounting to \$2,113 for 1900. The company will pay the State a tax of \$63.44.

The O'Fallon, Ill., Telephone Company, composed of local capitalists, has begun the erection of poles preparatory to putting in a local telephone system, for which a franchise was recently granted by the town board.

The managers of the Wisconsin Telephone Company and the Kenosha city officials met a short time ago to settle the telephone war in that city. The company will place its wires in cables in the business streets of the city.

Telephone Improvements in Nova Scotia.

The Nova Scotia Telephone Company of Halifax has completed the work of putting a large number of its wires underground. The wires are all encased in heavy cables, and are well protected from the weather. The company has already expended about \$25,000 for trenching, cable, the laying of the latter, and other underground work. It will probably be a month before all wires are connected and in working order. As soon as this work is completed new up-to-date switchboards will be installed in the central office, and thereby the whole telephone system throughout the city will be simplified and improved.

Manager Harris hopes that in the course of two months all the improvements will be completed, and then the service will be equal to that found anywhere.

In speaking of the independent telephone situation, Judge J. M. Thomas of Cleveland, O., president of the Independent Telephone Association of the United States, lately said the movement was never in a better condition. He openly declared that the recent sale of the Erie Telephone & Telegraph Company to the Bell interests was an incalculable benefit to the independent companies, and explained that its control by the large national independent company was a menace and a drawback to the harmonious relations of the Telephone, Telegraph & Cable Company of America with the numerous telephone systems throughout the country, which are now being operated in opposition to the American Bell.

The new independent telephone system in Greeley, Col., is now in full operation and an unqualified success. The company has opened up a handsome office. Two hundred phones have already been placed in Greeley, forty at Evans and ten at La Salle. The company is contemplating extending its lines to other towns in that section. The Stromberg-Carlson central energy system is employed. The company has named an extremely low rate for its service. For residences, full metallic circuit, only \$1 per month will be charged. The rates to business concerns will be \$2 per month.

Jeffries Wyman, of Boston, a director of the Central New York Telegraph & Telephone Company, a part of the Bell system, was in Watertown, N. Y., last week for the purpose, it is said, of making overtures to the Citizens' Telephone Company to purchase the latter system, which extends throughout Northern and Central New York. An official of the latter company says his company will not sell out. The telephone war in that section is being waged in earnest.

The Toledo, O., Telephone, Telegraph & Messenger Company, which was organized last month announces that it will apply for a franchise at an early day and that the ordinance will be published before being put in the legislative hopper. The officers of the company are: J. H. Bellows president, C. F. Watts vice-president and counsellor, H. A. Merrell secretary, and A. M. Hough treasurer.

A telephone company has lately been chartered in Fayetteville, W. Va., with a capital of \$50,000, to build a complete telephone system over Fayette County, and connect with other long-distance lines. Work will commence immediately.

The Knickerbocker Telegraph & Telephone Company has engaged the top floor of the Rothschild building, at the corner of Fulton and Jay streets, Brooklyn, N. Y., which will ultimately be "Central," together with office space for the executive department. Robert Mason is in charge of the new offices.

A meeting of the stockholders of the eight rural telephone lines centering in Munith, Mich., was recently held for the purpose of establishing a uniform rate for switching. It was decided to hire W. H. Suyland and pay him at the rate of five cents per switch. The total number of phones on the eight lines is 175.

A telephone line is being built in Oregon by the Sunset Company from Jacksonville to the Upper Applegate country, and will probably be connected with the Grant's Pass Williams line.

The Western Union Telephone Company of Chicago has decreased its capital stock from \$100,000 to \$35,000 and number of directors from five to three.

Henry M. Fitch says he will extend the Highland Telephone line to Monroe, N. Y., as soon as the frost is out of the ground.

The whole system of the Maryland Telephone Company (Home) has been overhauled and improved by electrical experts in Hagerstown.

The growth of the Clinton Telephone Company the past year has been remarkable. There are 378 phones in Wilmington, O., and 572 in that company's county system. Every part of Clinton County is now connected, with exchanges at Wilmington and Sabina, and toll stations at Blanchester, Cuba, Clarksville, Bloomington, North Kingman, South Kingman, Lee's Creek, Lynchburg, Martinsville, Melvin, Midland, Memphis, Morrisville, New Antioch, New Vienna, New Burlington, Oakland, Port William, Reesville and Sligo. The Clinton Company has long-distance connection with nearly one thousand cities and towns in Ohio over the lines of the United States Telephone Company.

One hundred farmers near Keota, Ia., have planned to build a telephone line early next spring, which will not be equalled by many in the State. The line proper will be nine miles long, and will connect Keota and South English, at both of which points it will join the long-distance switchboards. In Lafayette and Liberty townships the farmers will be joined to the line by a perfect network of wires and will have all the advantages of living in a city with long-distance connections.

The Southern Illinois Independent Telephone Association met in Pickneyville, Ill., a short time ago, and made arrangements with the Kinloch Telephone Company for connections with the latter's long-distance lines to St. Louis, Mo. It is the purpose of the Kinloch people to extend their long distance lines to Duquoin, Ill., and there connect with the independent lines of Southern Illinois.

The St. Petersburg, Fla., Telephone Company, is making arrangements to put in a long-distance line to Tampa. The people of Tarpon Springs, Fla., have formed a co-operative company to put in a telephone system in their town, and expect to make arrangements to connect with the Tampa St. Petersburg line.

The board of public works of Newburgh, N. Y., has granted a franchise to the recently incorporated Colonial Telephone Company. The company is limited to a charge of \$36 a year for instruments in business places and \$24 a year in residences. Seven telephones are to be furnished free for use by the city.

At a recent meeting of the Ripley, O., town council a franchise was granted to the independent telephone company to erect poles and operate a telephone line in Ripley. Representatives of the company were present from Batavia and Delaware, O. Ripley already has the Central Union Telephone Company.

The town council at Worthington, O., has voted unanimously to grant a franchise to the Citizens' Telephone Company to put in an exchange there. It will be put in at once, operating not only to Columbus but to the district all around Worthington.

The new Citizens' Telephone Company of Terre Haute, Ind., probably will institute an interurban system by placing telephones in the homes of farmers in that section. In the smaller towns where there will be no exchange a toll box will be placed in a convenient locality.

A telephone war now rages in Orangeburg, S. C. An independent line seeks to enter and is favored by citizens because the older company, a Bell concern, has not complied with the conditions.

The local telephone exchange at Westerville, O., is about complete. There are nearly fifty phones in operation, and the rest of them will be connected shortly.

The new telephone line from Rockland to Norwell and Greenbush, Mass., is now completed and the different stations along the line connected.

TELEPHONE INCORPORATIONS.

The Chicago Telephone Supply Company, Chicago, Ill. Capital stock, \$25,000. Incorporators: George A. Briggs, Henry L. Briggs and Blanche W. Briggs.

The Alaska Townsite & Telephone Company, New York City—to manage telephones and telegraphs, and hold real estate. Capital stock, \$1,000,000.

The Hutchinson Telephone Exchange Company, St. Paul, Minn. Capital stock, \$25,000. Incorporators: M. W. Clay, W. S. Clay, W. W. Sivright, E. J. Stearns, W. E. Harrington, William Davidson and C. G. Odquist.

The Woonsocket Telephone Company, Woonsocket, S. D. Capital stock, \$2,500. Incorporators: E. M. Smith, S. A. Ramsey, J. C. Whiting and C. V. Templeton.

GENERAL ELECTRICAL NEWS.

Lighting.

Brownsville, Tenn.—The electric light plant at this place was recently destroyed by fire. The loss is estimated at \$8,000.

Chicago, Ill.—The city council has recommended the proposed bill for the municipal ownership of gas and electric plants.

Davenport, Ia.—The People's Light Company of this city has developed plans for the erection of a new electrical station in this city, at a cost of \$100,000, for the general supplying of light and power here.

Dickson, Tenn.—The voters are petitioning the Legislature to authorize a bond issue for the purpose of installing an electric light plant.

Haddonfield, N. J.—A new electric light company is being organized here to be known as the Consumers' Electric Light Company, to compete with the South Jersey Gas, Electric & Traction Company. The capital stock is placed at \$10,000.

Hawkinsville, Ga.—This place is to have electric lights in the near future.

Livingston, Mont.—Joseph Kountz and Samuel Mendenhall, proprietors of the Bozeman Electric Works, met with the city council and outlined a plan for an electric plant for this city. The matter of a franchise will be taken up at once and if no unforeseen delay occurs the plant will be ready by May 1.

Lumberton, N. C.—A special election will be held March 1 for the purpose of issuing bonds to build an electric light plant.

Madison, Wis.—The assembly recently discussed the plan for a State electric lighting plant to light the capitol and other State buildings, and a resolution was adopted calling upon the dean of the engineering college for an estimate of the cost of such a plant.

McIntosh, Minn.—The citizens are agitating the question of erecting an electric light plant.

Menasha, Wis.—The citizens of this place are agitating the question of erecting an electric light plant.

Napoleonville, La.—This city is about to vote on levying a tax for constructing an electric light plant.

Newport News, Va.—It is reported that the old electric light company has cut its lighting rates to 66¢, cents in anticipation of a fight with the new company.

Obion, Tenn.—This town contemplates the issuance of bonds for the purpose of erecting an electric light plant.

Provincetown, Mass.—Efforts are being made by out-of-town parties to establish an electric lighting plant here.

Riverside, Cal.—C. G. Baldwin has made a proposition to the board of trustees to supply this place with electricity.

San Juan, Porto Rico.—An electrician lately sailed from New York City to install a complete electric light plant on the plantation known as the Canovanas Sugar Factory, Limited, at Canovanas. There will be 600 sixteen candle power and twenty-five enclosed arc lamps.

Vincennes, Ind.—Edgar J. Julian has been appointed receiver for the recently established plant of the city electric lighting company of this place.

Warren, O.—The Warren Electric Light & Power Company is preparing to replace the 100 kw. Wood alternator with a 200 kw. alternator, giving the plant double its present capacity.

Xenia, Ill.—A company of local capitalists is arranging for the erection of an electric light plant here.

Street Railways.

Asbury Park, N. J.—There is every indication that by the middle of summer a continuous trolley road will run from Atlantic Highlands through Red Bank to Long Branch, to connect with the Asbury Park line.

Belvidere, Ill.—The Belvidere city council has granted the franchise asked for by the Rockford-Belvidere Electric Road.

Birmingham, Ala.—Robert Jamison, vice-president of the Birmingham Railway, Light & Power Company, states that the company will spend about \$500,000 in extending and improving the system. The line be-

tween here and Bessemer, 12 miles in length, is to be rebuilt entirely, 60-pound rails put down, and the line now operated by steam will be converted into an electric line, also the line between Powderly and Bessemer. This line is 7 miles long. A number of electric cars will be added to the equipment.

Brighton, Mich.—The village council has granted a franchise for thirty years to G. H. Winteres and associates to build an electric line through this village from Detroit to Lansing.

Canisteo, N. Y.—The question of building an electric railroad between here and Jasper is again being talked of.

Durham, N. C.—The Chapel Hill board of aldermen have granted the right of way for a trolley line from here to Chapel Hill. It is to be built by Northern capitalists.

East Liverpool, O.—Hait & Smith of Cleveland have secured a permit from the Columbiana County commissioners to build an electric railway line from Salem to this place passing through Lisbon. It will cover 28 miles.

Fort Edward, N. Y.—A proposed trolley line between here, Granville and West Pawlet, Vt., is being discussed and it is said meets with unanimous approval by the residents of the three villages.

Gainesville, Ga.—An electric car line for this place is now only a question of time. Men of means have the scheme in view.

Muncie, Ind.—E. T. Ice, of this city, is making arrangements to build an electric railway between here and New Castle.

New Rochelle, N. Y.—President Maher, of the Union Railway Company has been here lately arranging for a number of improvements which are to be made in the spring. Eventually the line will be continued to the county seat at White Plains. Another extension is to be built to a new pier at Neptune Bay. This will provide the trolley company with a steamboat landing and a place for unloading freight.

Ottawa, O.—Ottawa is trying to interest capital in building an electric line that will connect this city with Delphos, Defiance, Findlay and Lima.

Owosso, Mich.—At a special meeting of the council of Vernon a 30-year franchise was granted to Messrs. Bensen & Hadsall of this place for an electric road from here to Durand.

Painesville, O.—H. A. Everett has lately been granted a franchise for an electric railway from here to Fairport.

Poquonock, Conn.—A party of surveyors was recently at work between here and Noank in connection with the proposed new trolley road.

Readville, Mass.—Directors of the New York, New Haven & Hartford Railroad are now considering the proposition for the installation of a suburban electric service into the south terminal station. It has been decided that the power station of the suburban electric service will be located here.

Sheffield, Mass.—The Berkshire Street Railway Company has perfected its organization, its object being the building of an electric railway line from Maple Grove to this place. The road will be about 55 miles long, and will join the Hoosac Valley Railway at North Adams, connecting both ends of Berkshire County. The capitalization of the company is \$1,100,000.

Spencer, Ia.—Local men of means are trying to interest Eastern capitalists in a proposed electric line from Rossie to this place, and from here to Lake Okoboji and Spirit Lake.

Troy, O.—The New Carlisle, Troy & Springfield Electric Railroad Company was recently incorporated. The road is to be finished to this place by March 1, 1902.

West Chester, Pa.—A company is being formed for the purpose of building a trolley road from here to Downingtown, thence to Coatesville and Parkesburg.

Manufacturing.

Buffalo, N. Y.—The Adams Construction Company of this city has been formed to manufacture electrical equipments with a capital of \$5,000. H. S. Wasson,

J. O. Munroe and W. J. Jamison hold an interest in the concern.

Chicago, Ill.—The American Rail Bond Company capitalized at \$10,000, will manufacture rail bonds and electrical apparatus. The interested parties are M. M. Wood, George W. Conover and Wells Goodhue.

Laconia, N. H.—The Lakeport Manufacturing Company was recently incorporated here with a capital of \$6,000 for the manufacture of motor vehicles, engines, etc.

Syracuse, N. Y.—The Crouse-Hinds Electric Company of this city recently manufactured and shipped to the Wilson Aluminum Company of New York a switchboard which with all its equipment weighed sixteen tons. The contract price was upwards of \$10,000.

Troy, O.—This place may soon have an incandescent electric and arc light factory.

Company Matters.

Milwaukee, Wis.—The Milwaukee Electric Company has increased its capital stock from \$40,000 to \$150,000.

Philadelphia, Pa.—The annual meeting of the Pennsylvania Manufacturing, Light, Heat & Power Company for the year ending December 31 was held last week. The following directors were elected: Joseph B. McCall, Jeremiah J. Sullivan, William P. Conover, Jr., A. V. R. Coe and J. Marton Fultz.

Reading, Pa.—The Electrical Equipment Company of which William D. Jones is manager, is about to commence business and will carry an extensive line of electrical supplies and apparatus. It will also make a specialty in installing the same.

Wilmington, Del.—J. E. Rhoads & Sons have been awarded the contract for the dynamo belts for the Brandywine Springs Railway Company.

Power and Transmission.

Knoxville, Tenn.—It is stated that the Knoxville Power Company is planning to harness the power of the Tennessee River, which will enable it to furnish power at a minimum cost. Tully R. Cornick is counsel for the company, which is capitalized at \$800,000.

Occoquan, Va.—The mill property situated here has, it is understood been purchased by a Washington electrical concern for \$25,000. The purchasers, it is said, will utilize the water power at the falls for generating electricity, which will be conveyed by wire from this place to Washington.

Automobiles.

Cleveland, O.—Cleveland men, formerly conspicuous in the manufacture of bicycle parts and accessories, have organized the Automobile and Cycle Parts Company, with an authorized capital stock of \$5,000,000, and have purchased eight properties from the American Bicycle Company. Among those interested in the concern are: A. L. Garford, J. D. Climo, Windsor T. White, M. B. Johnson, E. H. Bourne and J. C. Hill.

New York City.—The Manhattan Automobile Company recently leased the private stables Nos. 62 and 66 West 43d street for a term of years, and also the building No. 502 West 38th street.

Portland Ore.—There is some talk of an electric automobile service between this city and Gresham and adjoining towns.

Toledo, O.—It is stated that representatives of the Remington Automobile & Motor Company of New York will shortly be in this city to confer with the chamber of commerce relative to removing its factory here.

Toronto, Ont.—Letters of incorporation have been granted to the Electric Cab Company, Limited, of this city. The company proposes to embark in the automobile business at once. It will establish eight or more electric cabs at regular rates, as well as two electric tallyhos for the tourist trade. C. A. Ward is president of the concern.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by **ELECTRICITY** from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: cert. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

NAME	Par	Capital Stock	Rate and Date of Last Div.	Bid.	Asked.	NAME	Par	Capital Stock	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—Feb 9						Hartford Conn.—Feb 9					
United Traction.....	100	\$5,000,000	\$5,000,000 1% Q.	109	111	Hartford Street Ry. Co.....	100	\$4,000,000	\$200,000 8% S., Oct.	109	—
(Consolidation of the Albany and Troy City Railway.)						Hartford & West Hartford RR.....	100	1,000,000	247,500	—	—
Allentown Pa.—Feb 9						Holyoke Mass.—Feb					
Allentown & Lehigh Val. Trac. Co.	—	4,000,000	1,800,000	—	15	Holyoke Street Ry. Co.....	100	600,000	600,000 8% A., June	207 1/2	210
Bridgeport, Conn.—Feb 9:						Hoboken N. J.—Feb 9					
Bridgeport Traction Co.....	100	2,000,000	2,000,000 1% Aug.	100	—	North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000 8%	109	—
Baltimore Md.—Feb 9						Indianapolis, Ind.—Feb 9					
United Railways & Elec. Co. com.	50	24,000,000	12,000,000	18 1/2	18 1/2	Indianapolis Street Ry.....	—	5,000,000	5,000,000	27	29
Boston, Mass.—Feb 9						Lancaster, Pa.—Feb 9					
New England Street Ry.....	25	5,000,000	1,081,925 1% Q., Jan. 15	—	—	Pennsylvania Traction Co.....	100	10,000,000	9,900,000	—	—
North Shore Traction Co..... com.	100	4,000,000	4,000,000	15	16	Lancaster & Col. Electric Ry.....	—	—	87,500	—	—
North Shore Traction Co..... pfd.	100	2,000,000	2,000,000 8% S. A. & O.	85	87	West End Street Railway.....	—	—	—	—	—
West End Street Ry. Co..... com.	80	10,000,000	4,000,000 8% S. A. & O., '99	98	98 1/2	Louisville, Ky.—Feb 9					
West End Street Ry. Co..... 8% pfd.	80	4,000,000	4,000,000 4% S., Jan.	112	118	Louisville Ry..... com.	100	4,000,000	3,500,000 1% Q., April	82	88
Boston Elevated R. R.....	100	10,000,000	2% Q. Aug. '99	169	170	Louisville Ry..... pfd.	100	2,500,000	2,500,000 2% S., Oct. 1	112	118
Brooklyn N. Y.—Feb 9:						Minneapolis, Minn.—Feb 9					
Brooklyn City Ry.....	100	2,000,000	1,928,400	235	240	Twin City Rapid Transit..... com.	100	17,000,000	15,010,000	—	—
Brooklyn Exp. Transit Co., tr. cert.	100	45,000,000	45,000,000	78 1/2	78 1/2	Twin City Rapid Transit..... 7% 1st	—	8,000,000	1,712,300 1% Q., Oct.	106	107 1/2
Brooklyn Heights Railroad.....	100	200,000	200,000	107	109	Montreal, Canada.—Feb 9					
Brooklyn City RR..... guar.	100	13,000,000	12,000,000 8% Q., Jan.	207	209	Montreal Street Ry. Co.....	80	4,000,000	4,000,000 8% S. M. & N.	271	273
Brooklyn, Queens Co. & Sub. RR.....	100	2,000,000	2,000,000	—	—	Toronto Street Ry. Co.....	100	6,000,000	6,000,000 1% S. J. & J.	107 1/2	107 1/2
Queens Island & Brooklyn RR.....	100	2,000,000	1,864,300 2% Q. Nov., '99	325	332	Memphis Tenn.—Feb 9:					
Kings County Elevated.....	100	4,750,000	4,750,000	—	—	Memphis Street Railway Co.....	100	800,000	800,000	25	—
Kings County Traction Co.....	100	4,500,000	4,500,000 1% July	—	—	New Haven, Conn.—Feb 9:					
Massa Electric Railroad..... pfd.	50	6,000,000	6,000,000	75	80	Fair Haven & Westville RR.....	25	2,000,000	2,000,000 8% S., Sept.	39	41
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000	—	—	New Haven Street Railway Co.....	100	1,250,000	1,000,000 2% Q. A., July	—	—
Brooklyn, R. & W. R. Railroad.....	—	1,000,000	1,000,000	—	—	New Haven & Centerville.....	100	700,000	800,000	—	—
Buffalo N. Y.—Feb 9						Winchester Avenue RR.....	25	1,000,000	800,000	45	46
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	74	75	New Orleans, La.—Feb 9					
Buffalo Railway Co.....	100	6,000,000	5,970,500 1% Q. Dec., '99	99	100	Canal & Oldbourne RR. Co.....	40	240,000	240,000 4% S., July	—	—
Columbus O.—Feb 9						New Orleans & Carrollton RR.....	100	1,300,000	1,300,000 1% Q., Oct.	148 1/2	150
Columbus Street Railroad.....	100	8,000,000	8,000,000 1% Q., Feb.	85	89	New Orleans Traction Co. new com.	100	—	—	22 1/2	24
Columbus Street Railroad, pfd....	100	1,800,000	1,500,000	92	96	New Orleans Traction Co. new pfd.	100	—	—	96	96
Charleston, S. C.—Feb 9						Orleans City RR..... guar.	100	2,000,000	2,000,000 8% S., Jan.	30 1/2	35
Charleston City Ry. Co.....	50	100,000	100,000 8% S.	—	—	New Or. City & Lake RR..... guar.	100	2,000,000	2,000,000 4% S., Jan.	—	—
Enterprise City RR. Co.....	25	1,000,000	250,000	—	—	Orleans Railroad.....	50	500,000	185,000 1% Q., June	—	—
Chicago, Ill.—Feb 9						St. Charles Street Railway.....	50	1,000,000	1,000,000 1% Q., Oct.	68 1/2	69
Chicago City Ry. Co.....	100	12,000,000	12,000,000 8% Q., Dec. 31, '99	258	267	New York—Feb 9:					
Chicago & South Side R. T. RR.....	100	10,328,000	10,328,000	9 1/2	10	Central Croton RR.....	100	800,000	800,000 3% Q.	285	300
Lake Street Elevated RR.....	100	10,000,000	10,000,000	25	28	Christopher & 10th Sts. RR. guar.	100	850,000	850,000 2% Q., Oct.	175	185
Metropolitan West Side Elev. Ry....	100	15,000,000	9,000,000 Feb 25 1900.	25	28	Dry Dock, E. B. Ry. & Battery RR.	100	1,200,000	1,200,000 1% Q. Nov.	130	135
Met. West Side El., pfd.....	100	15,000,000	9,000,000	79	80 1/2	Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000 2% Q., Feb. 1900.	162 1/2	162 1/2
North Chicago Street RR.....	100	10,000,000	6,000,000 8% Q., Jan.	208	210	Bleeker St. & Fulton St. Ry. guar.	100	900,000	900,000 3% A., July	85	87
North Chicago City RR.....	100	10,000,000	6,000,000	197	200	Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000 2% Q.	282	290
South Chicago City Railway.....	100	500,000	249,000	99 1/2	100	Con. Park N. & E. Rivers RR. guar.	100	1,800,000	1,800,000 2% Q.	192	200
West Chicago St. R. R. Co.....	100	2,000,000	1,608,200	99 1/2	100	Eight Avenue RR.....	100	1,000,000	1,000,000	390	405
Union Traction Ry..... com.	100	20,000,000	15,198,000 1% Q. Feb.	99 1/2	100	42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000 4% Q.	392	402
Union Traction Ry..... pref.	100	2,000,000	2,000,000 5% S.	49	50	Ninth Avenue RR.....	100	800,000	800,000	198	201
Cincinnati, Ohio.—Feb 9:						Twelfth Avenue RR..... guar.	100	2,000,000	2,000,000	285	295
Cincinnati Ind. Plane Ry..... com.	50	1,000,000	875,000	—	—	Twenty-third St. R. R. Co. guar.	100	800,000	800,000 4% Q.	408	419
Cincinnati Ind. Plane Ry..... pfd.	50	150,000	150,000	—	—	Second Avenue RR.....	100	2,500,000	1,852,000 2% Q., Jan.	198	201
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,000,000 3% Q. Feb.	75	78	Third Avenue RR.....	100	12,000,000	10,000,000 5 1/2% p. sh. Feb.	121	121 1/2
Cincinnati Street Ry. Co.....	100	15,000,000	14,000,000 1% Q., Jan.	124 1/2	125	42d St. Manhattan & St. Nicholas Av.	100	2,500,000	2,500,000	65	76
Eden Park & Adams St. Ry. Co.....	50	2,500,000	2,300,000 1% Q., Jan.	124 1/2	127	Union (Huekl-berry) St.....	100	2,000,000	2,000,000	190	200
Cleveland, Ohio.—Feb 9						Newark N. J.—Feb 9:					
Acron, Ed. & Cle. Elec. Ry.....	100	1,000,000	1,000,000 3% Q., Jan.	48	50	Consolidated Traction Co. of N. J....	100	15,000,000	15,000,000	61 1/2	62
Cleveland City Ry.....	100	8,000,000	7,900,000 8 1/2% Q., Jan.	102	103 1/2	North Jersey Railway Co.....	100	6,000,000	6,000,000	24 1/2	25
Cleveland Electric Ry.....	100	12,000,000	12,000,000 3% Q., Oct., '99	88	84 1/2	United Elec. Co. of New Jersey..	100	804,000	804,000 11% Q. A.	22	24
Detroit, Mich.—Feb 9						Pittsburg, Pa.—Feb 9					
Detroit Citizens' Street Ry.....	100	2,000,000	1,250,000	100 1/2	—	Allegheny Traction Co.....	50	500,000	100,000	27	28
Fl. Wayne & Belle Isle Ry.....	100	—	1,200,000	175	—	Consolidated Traction Co..... com.	50	15,000,000	15,000,000 2% Jan.	28	28 1/2
Rapid Railway Co.....	100	250,000	250,000	100 1/2	—	Consolidated Traction Co..... pfd.	50	9,475,850	8% Nov.	86	87
Wayne & Detroit River Ry.....	100	1,000,000	1,000,000	90	100	Central Traction Co.....	50	1,800,000	1% Nov.	72 1/2	75
Dayton O.—Feb 9						Citizens Traction Co.....	50	8,000,000	8% A.	72 1/2	75 1/2
City Railway Co..... com.	100	1,500,000	1,470,800 1% Q.	140	145	Duquesne Traction Co.....	50	8,000,000	8% A.	—	—
City Railway Co..... pfd.	100	600,000	600,000 1% Q.	170	—	Pittsburg Traction Co.....	50	2,500,000	8% Nov.	—	—
People's Street Railway.....	100	1,100,000	1,100,000	114	115	Federal St. & Pleasant Valley Ry.	25	1,400,000	3% Q., July	27	29

* Unlisted. † Ex div.
 a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.
 b Leased to Boston Elevated Railroad Company.
 c Owned by Brooklyn Rapid Transit Company.
 d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
 e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
 f Owned by Kings County Traction Company; road leased to Nassau Electric R.R.
 g Owned by Atlantic Ave. RR. and leased to Nassau system.
 h 50% of stock owned by North Chicago Street Railway Company.
 i Controls by Chicago West Division Railway, Chicago Passenger Railway, and 15% per annum paid on outstanding capital as rental by lessee—West Chicago St. R.R. Co.; \$250,000 of stock owned by West Chicago Street Railroad Tunnel Company.
 j Majority of stock owned by Chicago West Division Railway Company; 5% on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
 k Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex-div.
 a Leased to New Orleans Traction Company at 6% on stock.
 b Leased to New Orleans Traction Company at 8% on stock.
 c Leased to Central Croton Railroad at 8% on stock and interest on bonds.
 d Operating the former Met. Trac. system, that corporation having become extinct.
 e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
 f Leased to Houston, West Street & Pavyon Ferry—now Metropolitan Street Railway.
 g Leased to Metropolitan Street Ry. at 8% on stock until Oct. 1, 1897; thereafter 9%.
 h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1895, at \$215,000 per annum.
 i Leased to Metropolitan Street Railway for 18% on stock.
 j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6% first 5 years, 8% thereafter.
 k Leased to Metropolitan Street Railway for \$145,000 per annum.
 l Leased to Metropolitan Street Railway for 18% on capital stock.
 m Controlled by Third Avenue Railroad by purchase.
 n Dividends of 1% yearly guaranteed by Consolidated Traction Company.
 o Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.
 p Leased to Consolidated Traction Company for 8% per annum on par value of stock.
 q Leased to Fort Pitt Traction Company for 6% on \$3,000,000 capital stock.
 r Leased to Consolidated Traction Company for 4% on capital stock.
 s Leased to Consolidated Traction Company for 7% on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock.		Rate and Date of Last Div.	Eld.	Asked.	NAME.	Par	Capital Stock.		Rate and Date of Last Div.	Eld.	Asked.
		Author's'd	Issued.						Author's'd	Issued.			
New Bedford Mass.—Feb 9													
Union Street Railway Co.	100	800,000	800,000	2% Feb.	100	100	Boston, Mass.—Feb 9	100	80,000,000	28,000,000	4% Q. Jan.	100	100
Northampton, Mass.—Feb 9													
Northampton Street Ry.	100	800,000	330,000	4% A. June.	170	170	American Tel. & Tel. Co.	100	80,000,000	28,000,000	1% Q. Feb. 20.	100	100
Omaha, Neb.—Feb 9													
Omaha Street Ry.	100	5,000,000	5,000,000	8% A. and N.	55	55	Erie Telegraph & Telephone Co.	100	10,000,000	10,000,000	1% Q. Feb. 20.	100	100
Paterson, N. J.—Feb 9													
Paterson Ry. Co.	100	1,300,000	1,300,000	—	54	—	New England Telephone Co.	100	10,000,000	10,000,000	1% Q. Feb.	100	100
Providence, R. I.—Feb 9:													
United Traction & Electric Co.	100	2,000,000	2,000,000	5% Q. Oct. '93	110	111	New York.—Feb 9:						
Philadelphia.—Feb 9													
Fairmount Park Trans. Co.	50	2,000,000	1,770,000	2% Q. Jan. 15, '99	24	24	American Telegraph & Cable Co.	100	14,000,000	14,000,000	1% Q. Q.	100	100
Hestonville, Man. & Fairmount	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Central & South Am. Tel. Co.	100	10,000,000	10,000,000	1% Q. Q.	100	100
Hestonville, Man. & Fairmount	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Commercial Cable Co.	100	10,000,000	10,000,000	1% Q. Q.	100	100
Fairmount Pk. & Had. Pass. Ry.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Franklin Tel. Co.	100	1,000,000	1,000,000	1% Q. Q.	100	100
Union Traction Co.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Erie Telegraph & Telephone Co.	100	5,000,000	4,800,000	1% Q. Feb.	100	100
Electric Traction Co.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Gold & Stock Tel. Co.	100	5,000,000	5,000,000	1% Q. Q.	100	100
Citizens' Passenger Ry.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	International Ocean Tel. Co.	100	5,000,000	5,000,000	1% Q. Q.	100	100
Frankford & Southwark Pass. Ry.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Mexican Telephone Co.	100	2,000,000	2,000,000	1% Q. Q.	100	100
Lehigh Avenue Ry. Co.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	New York & New Jersey Tel. Co.	100	5,000,000	5,000,000	2% Q. Jan.	100	100
Lombard & South Street Ry.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Pacific & Atlantic Tel. Co.	100	5,000,000	5,000,000	2% Q. Jan.	100	100
Second & Third Streets Ry.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1% Q. Q.	100	100
People's Traction Co.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	South & Atlantic Tel. Co.	100	5,000,000	5,000,000	2% Q. Q.	100	100
Germanatown Passenger Ry.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Commercial Union Telegraph Co.	100	5,000,000	5,000,000	1% Q. Q.	100	100
Green & Coates Passenger Ry.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Western Union Telegraph Co.	100	5,000,000	5,000,000	1% Q. Q.	100	100
People's Passenger Ry.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Div. guar. by Postal Tel. Co.	100	5,000,000	5,000,000	1% Q. Q.	100	100
People's Passenger Ry.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Miscellaneous.—Feb 9:						
Philadelphia Traction Co.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	American Dist. Tel. (Phila.)	100	5,000,000	5,000,000	1% Q. Q.	100	100
Catherine & Bainbridge St.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Bell Teleph. Co. (of Canada)	100	5,000,000	5,000,000	2% Q. Q.	100	100
Continental Pass. Ry.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Chesapeake & Potomac Tel. Co.	100	5,000,000	5,000,000	1% Q. Q.	100	100
Empire Passenger Ry. Co.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Chicago Telephone Co.	100	5,000,000	5,000,000	1% Q. Q.	100	100
Philadelphia City Pass. Ry.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Central Dist. Tel. & Tel. Co. (Phila.)	100	5,000,000	5,000,000	1% Q. Q.	100	100
Philadelphia & Gray's Fy. RR.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Empire & Bay States Tel. Co.	100	5,000,000	5,000,000	1% Q. Q.	100	100
Bridge Avenue Passenger Ry.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Hudson River Telephone Co.	100	5,000,000	5,000,000	1% Q. Q.	100	100
Philadelphia & Dart. Ry. guar.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Northwestern Telephone Co.	100	5,000,000	5,000,000	1% Q. Q.	100	100
Fifth & 19th Sts. Pass. Ry. guar.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Providence (R. I.) Tel. Co.	100	5,000,000	5,000,000	1% Q. Q.	100	100
Thirteenth & 15th Sts. Pass. Ry.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Southern New Eng. Tel. Co.	100	5,000,000	5,000,000	1% Q. Q.	100	100
Union Passenger Ry. Co.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	ELECTRIC LIGHT AND ELECTRICAL MFG. COS.						
West Philadelphia Pass. Ry.	50	1,960,100	1,960,100	2% Q. Jan. 15, '99	24	24	Boston, Mass.—Feb 9						
Rochester, N. Y.—Feb 9													
Rochester Railway Co.	100	5,000,000	5,000,000	—	20	20	Fort Wayne Electric trust receipts	100	5,000,000	5,000,000	3% Q. Aug. 1898.	100	100
Reading, Pa.—Feb 9													
Reading Traction Co.	100	1,000,000	1,000,000	Semi-ann. Jan. & July	24	26	Fl. Wayne Elec. Co. T. Sec. Series A.	100	5,000,000	5,000,000	1% Q. Apr. 1900	100	100
City Passenger Ry.	100	1,000,000	1,000,000	Semi-ann. Jan. & July	24	26	General Electric Co. (old)	100	5,000,000	5,000,000	1% Q. Apr. 1900	100	100
East Reading Electric Ry.	100	1,000,000	1,000,000	Semi-ann. Jan. & July	24	26	General Electric Co. (new)	100	5,000,000	5,000,000	1% Q. Apr. 1900	100	100
St. Louis Mo.—Feb 9													
South Street & Arsenal Ry.	50	500,000	500,000	—	20	20	T. H. Elec. Co. T. Sec. Series C.	100	5,000,000	5,000,000	1% Q. Apr. 1900	100	100
Jefferson Avenue Ry. Co.	50	500,000	500,000	—	20	20	Westinghouse Elec. & Mfg. Co. com.	100	5,000,000	5,000,000	1% Q. Apr. 1900	100	100
Lindell Ry.	100	2,500,000	2,500,000	—	20	20	Westinghouse El. & Mfg. Co. pfd.	100	5,000,000	5,000,000	1% Q. Apr. 1900	100	100
National Railway Co.	100	2,500,000	2,500,000	—	20	20	Westinghouse El. & Mfg. Co. assent.	100	5,000,000	5,000,000	1% Q. Apr. 1900	100	100
Cass Avenue & Fair Grounds	100	2,500,000	2,500,000	—	20	20	New York.—Feb 9						
St. Louis RR.	100	2,500,000	2,500,000	—	20	20	Edison Elec. Ill. Co., New York	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100
Missouri RR.	100	2,500,000	2,500,000	—	20	20	Edison Elec. Ill. Co., Brooklyn	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100
People's RR. Co.	50	500,000	500,000	—	20	20	Edison Ore. Milling Co.	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100
United Electric Ry.	100	2,500,000	2,500,000	—	20	20	Electric Vehicle Co.	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100
St. Louis & Suburban Ry.	100	2,500,000	2,500,000	—	20	20	General Electric Co. (old)	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100
Union Depot RR.	100	2,500,000	2,500,000	—	20	20	General Electric Co. (new)	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100
San Francisco, Cal.—Jan.													
California St. Cable RR.	100	1,000,000	1,000,000	—	20	20	Interior Conduit & Insulation Co.	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100
Geary Street Park & Ocean RR.	100	1,000,000	1,000,000	—	20	20	Kings Co. El. L. & P. Co.	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100
Market Street Ry.	100	1,000,000	1,000,000	—	20	20	Pittsburg, Pa.—Feb 9						
Presidio & Ferries RR.	100	1,000,000	1,000,000	—	20	20	Allegheny County Light Co.	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100
Scranton Pa.—Feb 9:													
Scranton Railway Co.	100	5,000,000	5,000,000	—	20	20	East End Electric Light Co.	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100
Scranton & Carbondale Trac. Co.	100	5,000,000	5,000,000	—	20	20	Philadelphia, Pa.—Feb 9						
Scranton & Pittston Traction Co.	100	5,000,000	5,000,000	—	20	20	Edison Electric Light Co.	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100
Springfield Ill.—Feb 9													
Springfield Consolidated Ry.	100	750,000	750,000	—	20	20	Electric Storage Battery Co. com.	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100
Springfield O.—Feb 9													
Springfield Street Ry.	100	1,000,000	1,000,000	—	20	20	Electric Storage Battery Co. pfd.	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100
Springfield, Mass.—Feb 9:													
Springfield Street Ry.	100	1,300,000	1,160,700	8% A.	207	212	Northern Elec. Light & Power Co.	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100
Toronto Canada.—Feb 9:													
Toronto Street Ry.	100	6,000,000	6,000,000	1% Q. S.	108	109	Southern Elec. Light & Power Co.	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100
Montreal Street Railway Co.	100	4,000,000	4,000,000	4% S.	272	273	Miscellaneous.—Feb 9						
Washington, D. C.—Feb 9:													
Belt Ry. Co.	50	500,000	500,000	—	20	20	Bridgeport (Conn.) Elec. Lt. Co.	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100
Capital Traction Co.	100	12,000,000	12,000,000	65c. per sh. Oct. '98.	102	102	Missouri Edison (St. Louis) com.	100	5,000,000	5,000,000	1% Q. Oct. '98.	100	100</

PASSENGER RAILWAY.

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PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bld.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—Feb 9, 1901						
Jefferson Avenue Ry.....1st mtg. 5s.	400,000	400,000	1905	M. & N.	108	105
Lindell Ry. Co.....1st mtg. 5s.	1,500,000	1,500,000	1911	F. & A.	108	109
Missouri R.R. Co.....1st mtg. 5s.	1,000,000	700,000	1916	M. & S.	105	106
Mount City R.R. Co.....1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's R.R. Co.....1st mtg. 6s.	125,000	125,000	1902	J. & D.	.....	.....
People's R.R. Co.....2d mtg. 7s.	75,000	75,000	1902	M. & N.	.....	.....
People's R.R. Co.....Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric.....1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis R.R. Co.....1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99%	100%
St. Louis & Sub. Ry.....1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5s.	800,000	800,000	.....	.....	80	84
Southern Electric Ry.....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
Taylor Avenue St. Ry.....1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot R.R. Co.....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100%
Union Depot R.R. Co.....Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122
Controlled by St. Louis R.R. Co.						
Controlled by Union Depot R.R. Co.						
Controlled by Lindell R.R. Co.						
\$200,000 in escrow to retire 1st & 2d mtg.						
\$500,000 in escrow.						
\$200,000 in escrow to retire 1st mtg. 6s.						
San Francisco Cal.						
Date of Quotation—Feb 9, 1901.						
California St. Cable R.R.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	.....	117
Geary St., Park & Ocean R.R.....1st mtg. 5s.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126%	.....
Metropolitan Ry. Co.....1st mtg. 6s.	200,000	.....	.....	.....	.....	.....
Omnibus Cable Co.....1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126%	.....
Park & Cliff House R.R.....1st mtg. 6s.	850,000	850,000	1912	J. & J.	105%	107
Park & Ocean R.R.....1st mtg. 6s.	250,000	250,000	1914	J. & J.	115	.....
Powell St. Ry.....1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co.....1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	.....	.....
Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Feb 9, 1901						
Belt Ry. Co.....Cons. mtg. 5s.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 6s.	500,000	500,000	1914	A. & O.	182	.....
Eckington & Soldiers' Home, 1st mtg. 6s.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan R.R. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	.....	.....
\$50,000 in escrow to retire 1st mtg. 6s.						
Miscellaneous.						
Date of Quotation—Feb 9, 1901.						
Bridgeport Traction Co.....1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 6s.	5,000,000	8,548,000	1981	F. & A.	118	.....
Chautauque St. R. (Ind'polis) 1st cons. m. 5s.	4,000,000	8,000,000	1988	M. & N.	104	105
Croftown St. Ry. (Buffalo) 1st mtg. 6s.	8,000,000	2,866,000	1982	M. & N.	112	118
Columbus (O.) St. Ry.....1st cons. g. 5s.	8,000,000	2,261,000	1982	J. & J.	115	.....
Consolidated Traction (N. J.) 1st mtg. 5s.	15,000,000	18,965,000	1983	J. & D.	111%	111%
Croftown St. Ry. (Colu's, O.) 1st mtg. g. 5s.	2,000,000	572,000	1983	J. & D.	115	115%
Denver City Cable Ry.....1st mtg. g. 6s.	4,000,000	8,800,000	1920	J. & J.	20	.....
Denver Con. Tram'y Co.....Con. m. g. 5s.	4,000,000	922,000	1988	A. & O.	80	85
Louisville (Ky.) Ry.....1st cons. mtg. g. 5s.	6,000,000	4,981,000	1980	J. & J.	119	119%
Minneapolis St. Ry. 1st cons. mtg. g. 5s.	5,000,000	4,050,000	1919	J. & J.	110%	110%
No. Hudson Co. Ry. (N. J.) Cons. mtg. 5s.	8,000,000	2,378,000	1928	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.) 2d mtg. 6s.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.) Deb. 6s.	500,000	489,000	1902	F. & A.	.....	.....
Paterson (N. J.) Ry.....Cons. mtg. g. 6s.	1,250,000	1,000,000	1981	J. & D.	.....	.....
Rochester (N. Y.) Ry.....1st mtg. 5s.	8,000,000	2,000,000	1980	A. & O.	.....	.....
St. Paul City Ry.....Cons. g. 5s.	5,500,000	4,298,000	1987	.....	105%	106
St. Paul City Ry.....Deb. g. 6s.	1,000,000	1,000,000	1900	.....	108	.....
\$1,000,000 in escrow to retire 1st and 2d mtg. 6s.						
\$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
\$700,000 in escrow to retire bonds of C. St. R.R. Co.						
\$87,000 in treasury.						
\$960,000 res'ed to redeem prior liens.						
\$620,000 in escrow.						

*With int' res

ELECTRIC LIGHT AND ELECTRICAL MFG. COOS

Boston, Mass.						
Date of Quotation—Feb 9, 1901.						
Delaware Gas Lt. Co.....1st m. 5s. g.	800,000	800,000	.....	J. & J.	106	108
Edison Elec. Illuminating Co., Boston.....	2,026,000	.....	.....	Quar.	157	.....
General Electric Co. gold coup. deb. 5s..	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa						
Date of Quotation—Feb 9, 1901						
Allegheny County Light Co.....6s.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Scrip 6s.	195,570	.....	.....	M. & S.	.....	.....
Miscellaneous.—(Feb 9, 1901.)						
Edison El. Ilig. Co. (N. York) 1st m. 5s..	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilig. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1998	.....	124	.....
Edison Elec. Ilig. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122%	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	.....	1987	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 6s.	5,176,000	.....	1997	A. & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5s.	8,000,000	.....	.....	F. & A.	102%	.....
United Elec. Light & Power Co (N. Y.)...	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—Feb 9, 1901.						
American Bell Telephone.....4s.	.....	.....	1908	F. & A.	100%	101
Northwestern Telegraph Co.....7s.	.....	.....	.....	.....	.....	.....
N. Y. & N. J. Telep & Telg Co. gen. mtg. 5s.	.....	.....	.....	.....	114	115
Chesapeake & Potomac Teleph. Co.....5s.	.....	.....	1911	J. & D.	108	106

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—Feb 9, 1901.						
American Electric Heating.....7s.	500,000	500,000	.....	.....	.....	.....
Armington & Sims Engine Co.....	.....	.....	.....	.....	25	.....
Barnes & Smith Car Co.....6s.	.....	.....	1949	J. & J.	106	107
Carborundum Mfg Co.....6s.	.....	.....	1904	J. & D.	.....	.....
Worthington Pump Co.....	75,000	.....	.....	.....	115	127

Valued

Nominal.

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½¢@16¼¢.; Lake, 16½¢@17¢.; casting, 16½¢@16¼¢.

The Durham Traction Company, with a capital of \$1,000,000, has been incorporated at Raleigh, N. C.

Brooklyn Rapid Transit stock has been neglected during the past week, but it closed higher than a week ago.

The exports of copper thus far this month amount to 2,457 tons. The market is dull and steady.

Pennsylvania Electric Vehicle preferred sold at 2½ on Saturday, a gain of 1 point. The stock has been inactive for several weeks.

Vice-President E. B. Maltby has been elected president of the Boston Electric Light Company. Director I. T. Burr was elected vice-president.

The elevated railroads of Chicago have held by the January gain over last year thus far this month. The first week of February is said to have shown something like 2 per cent. gain.

In Wall Street it is considered that Pennsylvania Railroad interests are purchasing Brooklyn Rapid Transit stock, and that the system may be leased or purchased outright by Pennsylvania.

An arrangement is said to have been made whereby all the street railways south of Boston owned by the Massachusetts Electric Companies will come under one management, to be known as the Old Colony Street Railway.

It is rumored in Chicago that the Lake Street Elevated Railway Company will consolidate with the Northwestern Elevated Railroad Company, as a preliminary step to a general unification of all the Chicago overhead lines.

The project of a consolidation of the Edison Illuminating Company and the Boston Electric Light Company has been entirely abandoned and the offer of a lease guaranteeing 10 per cent. by the Edison Company has been rejected.

Assemblyman Hatch has introduced a bill in the New York Legislature imposing a State tax of ½ per cent. on gross earnings and 3 per cent. on all dividends in excess of 4 per cent. on all surface and elevated railroads not operated by steam.

Suit for \$50,000,000 has been begun in the U. S. Circuit Court at Chicago by the Atlantic & Western Telephone Company against the American Bell Telephone Company and its subsidiary companies for alleged infringement of a patent on long distance telephones.

The California Copper Company, with a capital of \$2,500,000, was incorporated in Trenton, N. J., February 8 to do a mining business. The incorporators are George H. Sullivan, Henry W. Clark and M. B. Parsons, of New York, and William J. Curtis, of Summit, N. J.

A dividend of 1½ per cent. on the preferred capital stock of the Metropolitan West Side Elevated Railway Company, Chicago, has been declared by the directors, payable February 28 to stockholders of record at the close of business February 18.

Bills have been introduced into the Legislature of New York, Connecticut and Rhode Island, to permit a surface railroad to acquire right-of-way by condemnation. It is thought that these bills are in the interest of the proposed electric line between New York and Boston.

The arguments in the mandamus proceedings against the Union Traction Company of Chicago were resumed on the 8th inst., which practically puts to rest the theory that the company had compromised with the city, agreeing to lower the tunnels in return for franchise extensions.

The Boston Stock Exchange sends out the following: "On and after March 1 the engraved certificates of the Massachusetts Electric Companies will constitute a good delivery. American Telephone & Telegraph Company has been taken from the unlisted sheet and placed on the regular list."

The Boston "Globe" states that the directors of the New Haven Railroad Company have finally decided to make a trial of the third rail system as applied to Boston suburban traffic. Probably the Forest Hills and Dedham line will be the first to be equipped. It is believed the new system can be placed in operation within a year.

At the annual meetings of the three electric railway lines, controlled by the Cataract Power Company of Hamilton, Ont., good showings were made in connection with each company. The reports of each of the lines disclosed a substantial surplus over the operating expenses, fixed charges and the 5 per cent. dividend that was declared.

At the annual meeting of the National Gramophone Corporation, held recently, the following directors were elected: E. R. Johns, George H. Robertson, Frank J. Dunham, W. T. Hepper, Edwin W. Hines, O. D. La Dow and Frank A. Crandall. It was stated that, as the expert accountants are still engaged on the company's books, no financial statement could be presented. The meeting was adjourned to March 6.

An entirely new theory has come to light bearing on the Manhattan Elevated Railroad Company of New York. According to the New York "Times" the New York Central is seeking to lease the road. That journal claims this knowledge was gleaned from a director of the Manhattan, and that it is declared the New York Central will lease the Manhattan much after the same style as it was stated the Metropolitan proposed to lease the road—a lease to run for 99 years, practically in perpetuity, and under its terms 5 per cent. to be paid to Manhattan stockholders for five years (when the system will then certainly be entirely operated by electricity), and 6 per cent. thereafter.

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EDITORIAL NOTES.

The Patent Laws.

While it may not always
be wise to keep continually
revising laws, yet a meas-
ure which has been intro-

duced in Congress for the revision of the pat-
ent laws, along the line of correcting errors
that already exist in those laws through pre-
vious legislation, is one that is necessary.

Prior to its amendment on January 1, 1898,
Section 4,887 of the Revised Statutes limited
the life of all American patents to that of any
foreign country whenever an invention has
been first patented in that country. It was
amended at the date named so that the issue
of an American patent subsequent to that of a
foreign patent was, within certain named limi-
tations, altogether prohibited, but in every
case where the United States laws permitted a
patent to issue at all, those laws alone should
limit the life of the patent.

One section of that amendment repealed
that portion of the section which declared
that where an invention had been previously
patented in a foreign country the United
States patent should be limited so as to ex-
pire at the same time. Under that section,
had it remained as it passed the House, any
patent granted subsequent to the date of the
passage of the act would have been relieved of
this old limitation clause. But this was viti-
ated by a subsequent amendment at the hands
of the Senate, leaving the old statute in full
force as to limitations.

No sufficient reason can be given for refusing
to give applications filed prior to January 1,
1898, the same exemption from limitation by
foreign patents that is given by the act of
March 3, 1897, to applications filed subsequent
to January 1, 1898. While it has never been
the policy of the Government to change the
terms of grants already made, it may fix the
terms of patents to be granted, irrespective of
the time when the applications were filed.

The limitation of the term of American pat-
ents by foreign patents is a great hardship. It
was so recognized by Congress when the
amendment was adopted. The applicant in
this country cannot control the time when his
patent shall issue. If an applicant who filed
his application prior to January 1, 1898, is un-
fortunate enough to be involved in an interfer-
ence which may tie up his application for an
indefinite time, he may be obliged to forego

the obtaining of any foreign patents. Under
the old section, if he filed a single application
abroad and the foreign patent issues before he
can obtain his United States patent, the term
of his patent in this country is limited by the
foreign one. Therefore an opponent in an in-
terference proceeding, finding that the true
inventor has received a patent abroad, though
he may not be able to defeat the true inventor,
may delay the issuance of the patent for years,
and when the true inventor finally obtains his
patent it is for a term which may be limited to
but a few years, if, indeed, the term shall not
have already expired.

As to all patents filed on or after the date
named, the opportunity for this is entirely
wiped out by the act of March 3, 1897. It
would seem to be but fair and just that the
United States should relieve present as well as
future applicants from this hardship, and no
opposition can be made to it, unless it should
come from those who are seeking to defeat
rights to patents by delaying their issuance
through dilatory proceeding in interference.
The Committee on Patents has recommended
that the bill be passed without any unneces-
sary delay.

* * *

Progress of the Rapid Transit System.

Judging from the progress
that is being made on the
underground rapid transit
system for New York City
the first section should be

completed on or near the time originally speci-
fied, namely, three years. At present there
are some 2,000 men at work digging, blasting
and shoring up, while early in the spring this
number, according to the contractor, will be
doubled.

An excellent idea of the immensity of this
undertaking may be gotten by an inspection of
the work already done at 168th street and at
181st street. At both points vertical shafts
have been sunk from the top of the hill to the
level of the roadbed. At 168th street the
shaft, 32 feet in diameter, goes down 100 feet
through solid rock. The center line of the
vertical shaft is east of the roadbed and from
its foot a horizontal shaft extends to the line
of the tunnel where it widens out into a cham-
ber 51 feet in diameter. This chamber is the
underground passenger station. Two elec-
trically operated elevators will run in this shaft
and their carrying capacity and speed will be
sufficient to take care of all the passengers who
may leave a train before the next train comes

along two minutes later. At 168th street the shaft and the chamber are both completed, so far as taking out of rock is concerned. At 181st street, where the shaft extends down 120 feet, there is still some excavating to be done.

Compressed air is made use of for operating the drills. For the work on Washington Heights there is an air power plant near the river. The compressed air is forced up the hill through a six-inch pipe and distributed along the line of the tunneling wherever it is needed. There is another air power plant at Union Square, which furnishes power for operating the drills along the central section between Great Jones and 31st street.

Probably the most important problem to be solved is as to whether pipe galleries should be built in connection with the tunnel undertaking or not. At a recent meeting of the Social Reform Club Mr. William R. Corwine, Secretary of the Merchants' Association, referred in a speech to this subject. He said he had been unable to find anybody who did not agree with him on the general proposition of the benefit of pipe galleries, although some had different opinions as to the details to be considered in bringing about the building and management of the galleries. Speaking of the crowded condition of the present sub-street pipe system, he said it was no system but a general disorder. He recalled the recent bursting of a big water main in the bed of the old 42d street reservoir as evidencing the age and consequent weakness of some of the city's pipes.

In closing Mr. Corwine said that he favored the plan to give the present Rapid Transit Commission charge of arranging for pipe galleries.

Mr. Corwine's views are undoubtedly those of every person familiar with the existing conditions in the streets of this city, so far as underground structures are concerned. By all means let the city build suitable galleries, in which water mains, gas pipes and electrical conductors may be placed.

* * *

An American Exchange at Guadeloupe.

Manufacturers are always on the outlook for new markets, and to such it may be interesting to learn that an American exchange has been established in the city of Guadeloupe, which has for its object the introduction of various lines of American manufactures not known in that market and the substitution of American for other foreign goods in lines that have already been established. For a number of years past our American Consul at Guadeloupe has been endeavoring to get some one to seriously take up such a project, but financial conditions had stood in the way. Recently there has been a marked improvement in these conditions; it may be that it is a reflex wave of the prosperity we are enjoying in the United States which is beginning to be felt in Guadeloupe. Be the reason what it may, conditions are such that they augur well for increased commercial intercourse between that country and ours.

The address of the exchange is "The American Exchange, Pointe a Pitre, Guadeloupe, West Indies," and it is understood that the concern is a responsible one. It is to be located in a building at present occupied by the Chamber of Commerce of that city, and all catalogues and samples are to be well displayed, and special inducements offered to all parties who may be in any way interested to visit it.

The manager speaks and writes English, is thoroughly acquainted with trade relations between Guadeloupe, the United States, France and England. It is his intention to send out circulars of inquiry, and solicit from manufacturers and exporters desiring to do business their catalogues and samples of what they have to offer. The goods to be handled will include steam engines and fittings of all kinds, steam and small pumps, machinery of various kinds, tools, corrugated iron, light portable railroads, etc. An additional opening may be found for electrical machinery, as there are a number of improvements already under consideration in Guadeloupe for the electric lighting of towns and cities, the establishment of steam and electric railroads, bridges, etc., and it is expected that they will be carried out at an early day. The American Exchange will try not merely to secure these important contracts, but to hasten their realization by demonstrating the rapidity and cheapness with which they can be accomplished by Americans.

It may be well to suggest at the present time that it is useless for those who desire to enter into competition for this trade to send catalogues without prices: the fullest and most detailed information should be given, together with the discounts. These figures, with samples, more important than anything else that can be offered, can be used to good advantage by the managers of the exchange, who will depend upon the discounts and other legitimate profits of regular business for its gains. The exchange will pay all freight expenses, duties, etc.; it will also receive on consignment sample orders of articles in well established lines from parties desiring to enter into competition for the business. Another important point to be remembered is that when orders are filled the greatest care should be exercised to see that the goods come up to the sample, and care should also be taken in packing. If American manufacturers will do their share, there is no reason why a valuable market for our products should not be opened, for the trade thus established will in time extend to Martinique and other West Indian Islands.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

ON February 14, Senator Brackett introduced a bill in the Legislature at Albany establishing a State laboratory of electrical engineering at Union College, Schenectady, and appropriating \$150,000 for its equipment.

A LARGE electric pump was tested a short time ago at the Jeunesville, Pa., Iron Works in the presence of 200 mining officials and several electrical experts. The pump will be placed in the Avondale mine of the Delaware, Lackawanna and Western Coal Company.

MR. F. MACIAS, a resident of Zacatecas, Mexico, recently stated that Mexican business men are rapidly adopting the styles and customs of the United States commercial tradesmen, also that electric railway building in Mexico is a matter of most concern to his people at present. In Mexico City there is now in operation about 20 miles of electric street railways, while in many other large cities the trolley is rapidly being introduced. This is ad-

vancement noticeable only during the past few years, but which promises great development. Business in general, is at its zenith, and the future of Mexico gives promise of much prosperity.

OVER the ordinary telegraph wires of the Cleveland, O., police signal system pictures were sent by electricity a short time ago, in a working test of the electrograph. The test was entirely successful and the pictures that were made by the receiving machine were said to be, the best ever sent.

THE electric searchlight that is to be installed on the electric tower of the Pan-American Exposition at Buffalo, N. Y., is destined to attract much attention. The searchlight which is a 30-inch projector will be the most wonderful light of its kind ever erected, and it will be operated on the 360-foot level of the electric tower. In order to more definitely locate this 360-foot level, it may be further pointed out that it is the level at which the tower makes the last contraction, and this is only 31 feet below the extreme apex or highest point of the tower and statue of the Goddess of Light that will surmount it. The beam from this searchlight will flash through the sky with a brilliancy that will cause it to be seen for a distance of at least 50 miles.

ENCOURAGED by what has been accomplished by other technical societies, and what they have recently seen abroad, the Council and Committee on Meetings of the American Institute of Electrical Engineers have arranged for a conversazione to be given by that body some time in April. Through the courtesy of Columbia University of New York, the conversazione will be held in the electrical engineering department, with the co-operation of Prof. Crocker, Dr. Pupin, Mr. G. F. Sever and others of the staff there, and so much interest has already been shown in the matter that a brilliant success is forecast. While the conversazione will be largely social in character, a special feature will be the exhibition of latest electrical apparatus, inventions, etc., in working condition. Mr. T. A. Edison, Prof. Elihu Thomson, Dr. Pupin and others have promised personal assistance in this respect, and as Mr. W. J. Hammer has that part of the programme in hand, and is working hard, it is believed that the demonstration of this kind will be one of the best ever seen in this city, especially as the electrical resources of the University will also be available. Secretary Pope and Mr. W. S. Barstow, chairman of the Papers and Meetings Committee, extend through the press an invitation to all members to contribute features of scientific interest and to give an early notification of what they will do in this respect.

PROF. WILLIAM H. BREWER of the Yale scientific school is the author of a bill presented to the Connecticut General Assembly last week, which will compel every electric railroad in the State to file a map of its lines. Prof. Brewer explains the purpose of the bill as follows: "By having these matters clearly shown on topographical maps it will be possible for any citizen interested in the matter to obtain information in a few minutes. As things are at present it would take hours or days to secure it. The bill is purely in the public interest and I anticipate no opposition to it except perhaps from professional lobbyists. The State is

gridironed from one end to the other with trolley lines on paper. This bill may serve the useful purpose of disclosing whether responsible parties are back of the projected lines and assist in determining whether the charters have been secured principally for the purpose of preventing somebody else from building."

THE trustees of the Rensselaer Polytechnic Institute at Troy, N. Y., have elected Director Palmer C. Rickett, president of the Institute, to succeed John H. Peck, resigned. By this election Prof. Rickett becomes the ninth president of the Institute. Besides writing a history of the Rensselaer Polytechnic Institute Prof. Rickett has been a constant contributor to scientific and other periodicals and is a member of many scientific societies and corporations, viz., the American Society of Civil Engineers, American Society for the Promotion of Engineering Education, the Trojan Car Coupler Company, the Standard Railroad Signal Company and the Chamber of Commerce.

A COLORADO man has invented an automobile for the use of farmers, and, it is said it will do the work of several teams of horses. The motive power for this machine may be either gasoline or electricity. It is adapted to plowing, cultivating, seed-planting or harvesting. The engine or motor is on the forward or drive wheels, which are joined by a long reach to the smaller rear wheels, over which the seat of the driver is placed. A large transverse bar, about six feet in length, crosses the reach-bar at its center. To this transverse bar the plowing, cultivating and other appliances for farm work may be attached. A very important feature of the invention is a mechanism that allows the operator to apply the whole power to any one of the wheels, thus making it easy to get the wheels out of any rut or hole in which they may get stuck. The wheels may be operated entirely independent of each other and by an ingenious steering device the farm "auto" can be turned within a very small compass.

It is said that electricity has been put to a novel use in New Jersey by a man who "wired" his sleigh for the benefit of the small boys who persisted in sharing it with him without waiting for an invitation and at the expense of the bright new paint. The wires were arranged around the "catching on" points and connected with a battery beneath the seat. An insulated cushion protected the rightful occupant. A foot lever providing the necessary opening and closing switch and a little judicious peeping from the corner of one eye supplied the driver with the knowledge of just when to push the button.

A MACHINE, which is attracting a good deal of attention in mining circles, is the Wetherill magnetic separator. This is a machine for separating and purifying such ores as are attracted by an electro-magnet. The principle is not, of course, at all new, but this machine, by the great power of its magnets, and concentration of the magnetic field, attracts many substances which are not affected by an ordinary magnet. Even gold is sometimes slightly attracted, though this is not usual. One of the best machines of this type in existence forms part of the equipment of the mining department of McGill University, Montreal. In this machine, the two magnets have a strength

of 40,000 ampere-turns, and by the peculiar shaping of the pole-pieces, all this force is concentrated into a space the size of half a lead-pencil. The powdered ore is carried on a belt under the poles of an electro-magnet. Just over the belt, and under the magnet-pole, is a second belt, running cross-ways. When the ore passes under the magnet, the magnetic particles of it rise and are held by the magnetic force to the under side of the upper belt. This belt carries them out of the field of the magnet, and they then drop into an appropriate receptacle. Meanwhile, the unmagnetic ore goes through the same treatment again, to insure a thorough separation, and is dumped into another receiver. It is thus possible to separate minerals, which are attracted by a magnet, from those which are not, and even to separate those which are attracted in different degrees.

MR. E. BAILEY, residing in York, England, has invented a means of producing white lead and other metallic compounds by electricity, says the London "Electrical Engineer." This is done by the use of the electric arc, the lead to be treated being kept in a molten state. The metal is acted upon by gaseous vapors, which produce carbonate of lead or any other required lead compound. The fumes produced are blown over into chambers having canvas or fine fabric cloth covers or roofs. The fine dry powdered white lead falls down and the undensable gases pass through the fine canvas roof, thus dispensing with grinding, washing and drying processes. It is claimed that there will be at least a saving of 50 per cent. in production by this process, which has been patented both in England and abroad.

THE Gold Coast Colony, in Africa, will soon receive a large consignment of American machinery, which has been ordered by a gold mining and dredging company. A dredging outfit including an electric light plant, worth in all \$20,000, was shipped to Liverpool last week. It is destined for Africa. When it arrives there it will be divided into more than 3,000 packages, and carried by native bearers 200 miles into the interior.

THE electric transmission line from the immense plant in the mountains of Calaveras County, Cal., was completed to San Jose, February 15, and preparations are complete to furnish light and power to the surrounding country. The value of manufacturing interests will be greatly enhanced by this power installation. New factories are contemplated, and the street railways of San Jose will use the current.

AN exceedingly novel electric clock system has just been installed in the new Washington school building at Lafayette, Ind.. There are twelve secondary clocks all run and controlled by a self-winding master clock, placed in the principal's office. This clock is six feet high and the dial is twelve inches in diameter. There is an indicator showing the exact time of the clocks in the different rooms, and an electric gauge showing the strength of the current used in operating them. The smaller clocks are simple in construction and need very little attention. It being only necessary to keep the battery in order. The hands of the secondary clock register the time every minute. Every sixty seconds the indicator on the master clock moves the hands on all the

secondary clocks and they are kept uniformly correct. This system is regarded as much cheaper than to place regular clocks in all the rooms. It requires no great amount of power to operate the system. Two cells of salammoneic battery are used in the master clock.

THE first power at Shawinigan Falls, Que., was turned on Thursday, the 7th inst. The first wheel and electric generator commenced to move, and the town, which two years ago, did not exist, but now has a population of over 3,000 persons, was lighted by electricity. The generator supplies a comparatively small amount of power, but it constitutes the initial step in a development of electric energy which promises to be the greatest in the world. The initial use of electricity at Shawinigan is notable in that the development of power from water there, with the exception of Niagara Falls, offers more scope than any other point in the world. The company has completed the hydraulic development of 75,000 horse power, which is about 25,000 more than has as yet been developed at Niagara. An electrical installation for 10,000 horse power is being put in place from which the company proposes to take its supply for the city of Montreal.

J. S. CRITCHLEY, member of the Institute of Mechanical Engineers, and manager of the automobile department of the British Electric Traction Company, Limited, of London, has been in this country recently investigating various things connected with the development of self-propelled vehicles. As engineer of the Daimler Company Mr. Critchley laid out the first automobile factory in England and has been an authority on the use and manufacture of automobiles ever since. Referring to the subject in a recent interview he said: "Except for your electric vehicles, New York seems to me to be about two years behind London in the use of automobiles. Your roads and streets are not so well adapted to their use as ours, of course, but besides that, you have not yet achieved the same excellence in model or construction. For speed and endurance some of the French types of automobiles are far in the lead, and I observe that certain French ideas are just now being taken up by some of your manufacturers. Your smaller electric vehicles are in advance of anything I have seen elsewhere, and I think some of your developments along that line will soon be imported by us."

THE possibility that Germany will lay a submarine cable across the Pacific long before the projects of the United States for expediting communication in that ocean are carried out is causing much perturbation among naval officers, who have been urging the project on Congress for the last two years, and this is, heightened by the latest announcement that the Caroline Islands, which were promptly purchased by Germany from Spain after the United States had declined to take them, and which form natural stepping stones half way across the Pacific, will soon be connected telegraphically with the rest of the world. The news comes to the State Department from Consul-General Guenther, at Frankfort. He has information to the effect that Germany and the Netherlands are planning to lay a new cable to connect with the Dutch East Indies, and make them independent of the British cable syndicate.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 15.

TRANSFORMERS.

A very common appliance, and practically an essential feature in alternating lighting, is the transformer, very often termed a converter. With this device current may be produced in a secondary winding of a coil by being acted upon and effected by the inducing condition produced by a primary winding of this coil through which the inducing current flows.

The name transformer might lead to the impression that the actual current is transformed or changed to the voltage required, which however is not the case, as it is a transformation of energy by the application of the laws of induction.

A transformer is an appliance acted upon by the laws of induction, whereby a changing electric current applied to one winding of a coil, called the primary, induces into another coil that comes within the inductive influence of it, and termed a secondary, electrical action, the ratio of the induced electrical action to the inducing current being controlled by the relation in inductive capacity that one winding bears to the other.

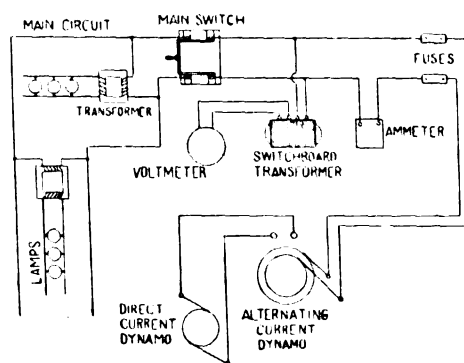
There are of course a larger number of different styles and types of transformers on the market, but the law or principle governing their action is the same. The difference in their appearance and method of construction is a result of the ambition of manufacturers to secure the most efficient and practical apparatus.

In transformers we have an excellent example of the transferring of power from one electrical circuit to another without being in any way electrically connected with each other and also without there being any mechanical motion concerned in the transformation. The circuits, although having no electrical connection with each other, must however come within the inductive influence of each other, and also with a view toward efficiency, their inductive relation should be such that practically all the influence created by one coil must act upon the other, that is, it is necessary for the magnetic circuit to be so arranged that the magnetism which is set up by the current in the primary coil shall all pass through the windings of the secondary coil.

Transformers are commonly used to reduce a high pressure, which is used on distributing circuits, to a lower electrical pressure, that may be conveniently and safely used in buildings to operate electric lights. They are also used for creating a higher electrical pressure than that generated by a dynamo. This may be done by so arranging the relation of the windings to each other, so that a much higher voltage will be given out on the secondary circuit than is applied to the primary. In this case the name "step-up" transformer is applied, and the advantage of this method is that a very high pressure can be secured and economical transmission of electrical energy over long distances may be attained. The same laws govern their action as that of the induc-

tion coil explained in a previous article, for a transformer is simply an induction coil in every sense of the word.

Starting at the first principle of the laws of induction, we know that an increasing current in a conductor induces into a parallel conductor a current with a tendency to flow in the opposite direction to the primary current; also when a flow of current is decreasing it will induce a current in a parallel conductor with a tendency to flow in the same direction as the inducing current. Now, understand this applies to parallel circuits or conductors, but in a coil is not every winding and turn of the wire parallel with each other? Then this inducing effect will be exerted on the turns and windings just the same as if it were an entirely separate coil; consequently in a coil an increasing current sets up a field which tends to retard the increase of the current, also when a current is decreasing the field set up then will tend to prevent the decay of the current.



ALTERNATING CURRENT PLANT.

Now apply these laws to the action of an alternating current when applied to a primary winding and you see that the influence set up by itself, acting upon its own windings, practically prevents any current flowing through the coil whatever; of course this will be governed by the magnetic efficiency of its construction and the rate of alternations of the current. Now let us add a second coil or winding that will also come within the magnetic influence. Its windings are also parallel to the inducing current and will be effected by the field produced by the current and will have induced into it a current flowing in the opposite direction to the primary pulsation when the current is tending to increase in the primary.

If the circuit of the secondary winding be complete, then electrical action will go on in this winding, that is to say, there will then exist an actual induced current which will also produce a field that will tend to assist the flow of the current in the primary, or overcome the retarding effect produced by the field of the primary. In fact the magnetic fields produced by the currents in the two windings or coils tend to neutralize the retarding effect that each field has on its own flow of current. The greater the amount of current permitted to flow in the secondary coil, the greater neutralizing effect will be acting upon the retarding influence of the primary field on the primary flow of current, and the more current will flow through the primary coil.

When there is no current being used from the secondary winding, then there will exist no flow of current in that coil and no field will be produced to effect the inducing field, and consequently no current will flow in the primary circuit.

However, when the circuit of the secondary is closed and current is flowing in the secondary winding, then there will be a field set up by it, depending upon the amount of current permitted to flow, and the amount of neutralizing effect on the retarding field of the primary will depend on the strength of this field.

Now you see the amount of current which will flow in the primary circuit will depend entirely upon and be controlled by the amount of current being used from or allowed to flow in the secondary circuit.

The primary usually consists of many turns of small wire, while the secondary consists of fewer turns of larger wire. In constructing a transformer the coils are generally wound on a "former" and are carefully insulated, in fact the insulation constitutes one of the most important features in their construction.

The iron cores which constitute the magnetic circuit of the transformer are usually made of strips on "stampings" of thin wrought iron, laid together and built up around the coil in such a manner that they make a core for the coils and also inclose them in a complete magnetic circuit to prevent any waste of the magnetic lines which are set up by the current in the coils.

The whole is then inclosed in an iron case or shell with the terminals of the coils extending through well insulated holes. Sometimes these terminals end on connectors in a convenient compartment constituting a part of the entire case and usually located at the bottom.

Quite often the case is filled with heavy paraffin oil, and this is considered a good feature as it aids considerably the efficiency of the insulation.

Great care must be exercised in the quality of iron used in the construction of transformer cores, just the same as in the cores of dynamo armatures, as the magnetism is reversed with every alternation of the current, and with the reversing of the magnetic molecules there is a loss of power caused by hysteresis.

There are no transformers manufactured that do not operate at a certain percentage loss in energy caused by hysteresis and eddy currents in the cores. The aim of the manufacturers is to reach in their construction such a degree of perfection that this loss may be made as small as possible.

The figure in this article gives a sketch of the manner of connecting transformers on a circuit and also the circuits from the station transformer on an alternating plant.

This drawing also shows the placing in a circuit of the different apparatus essential to an alternating plant and their respective positions in the circuit.

Article No. 16 will be entitled "Arc Lighting."

Experiments With Wireless Telegraphy.

H. Hodgson Wright recently gave two lectures at Halifax on Roentgen-ray photography and wireless telegraphy. On the latter subject he emphasized the fact that there were three known methods of communicating without the aid of wires—viz., the conduction, the induction, and the wave methods. Having shown how wireless messages were dispatched and received, the lecturer gave a striking experiment of the power of Hertzian waves by means of which a small motor was started at the opposite end of the room.

THE DEVELOPMENT OF THREE-PHASE WORKING IN THE TWENTIETH CENTURY.*

BY VAL. A. FYNN, M.I.E.E.

It is with the greatest diffidence that I approach the task of predicting the probable extent of development of this youngest and highly important branch of the electro-technical industry. Bearing in mind that electricity generally has only been commercially applied since, say, 1880, that the discovery of the principles underlying the particular branch now under discussion only dates from the year 1888, and that it was not until after the historical Lauffen-Frankfort power transmission that the three-phase system came into frequent use, one may well pause before attempting to prophesy what stage of development this system will have reached at the end of the next 100 years.

In the first 10 years of its existence it has made unparalleled progress; will it continue this triumphant course, or has it come within such distance of its ultimate perfection that each successive stage will only be reached slowly and at the expense of earnest and persistent work? I am inclined to think the latter is the case.

By taking a sufficiently sanguine view it would be quite safe to predict a most wonderful future, and nobody would be able to prove to me the error of my ways, since long before the expiration of the term I would be safe beyond all argument.

I will only attempt in what follows to briefly consider the several items which go to make up a three-phase transmission and distribution, point out what improvements are desirable, and those that may be looked for, and, finally, on that basis try to enumerate the principal cases in which the application of this system would seem to be consistent with the best economy.

Little need be said about the prime movers, since any of the well-known motors to-day may be successfully used for driving three-phase generators. The choice of the motor in every particular case will depend entirely on the local conditions, and will be limited only by the necessity of obtaining a steady drive. We are here dealing with alternators, and will no doubt require satisfactory parallel running, the variation of speed during one revolution must therefore not exceed a small value, varying with the design of the alternator. It is well to remember when specifying the limit of such variations that it depends entirely on what percent. of the polar division this variation represents; thus equally good results will be obtained if a variation of 1-128th per revolution be allowed in the case of a 16-pole generator, and a variation of 1-256th in the case of a 32-pole machine. Well-designed generators work very steadily with a variation per revolution corresponding to one-eighth of the polar division, and I know of cases where this figure was increased to one-fourth with impunity. These conditions are now easily obtained, and we find therefore nothing here to stop progress.

The three-phase generators themselves, considered from a mechanical point of view, are the most perfect yet known. Their weight per unit of speed and output is, under favorable conditions, the lowest of any for equal heating. They will stand excessive overloads better than any other type of generator.

*From the "Electrical Review," London.

Yet they are far from perfect; one important, and at present unavoidable, drawback exists. When working on a highly inductive circuit, the drop in pressure which they exhibit with increasing load necessitates the assumption of constants of such magnitude in their design, in order to keep this drop within reasonable limits, as to greatly increase their price. Even when this is done they remain behind their direct-current rivals, since they still require the "constant potential man" to prevent erratic variations of voltage.

Many men are now engaged in attempting to solve this problem; I hope that a solution will be found, but it must be one which strikes at the root of the evil, and does not follow the lines upon which most of the inventors are now working.

In America the old method of rectifying part of the armature current has been revived and so far improved, it is said, as to secure satisfactory compounding. Apart from the fact that such compounding cannot be equally correct for various conditions of phase displacement, it solves the problem but partially, since it does not allow of making the alternators as light as they could be.

It may appear to the one or the other that I am taking up trivial points for discussion; I may as well say at once that I hold the three-phase system to be one with many imperfections, and all of these must be removed if it is to compete successfully in all cases; it is in very few instances only where it is supreme, and then mostly from the fact that it is the only one possible. Where direct current can be employed it is mostly preferable in view of its great flexibility, better efficiency, and owing to its present stage of development, which does not necessitate the presence of the serious objections previously inseparable from the use of commutators.

One of the cases where the three-phase system is supreme is found when it becomes necessary to employ very high tensions in order to secure a reasonable return for the money invested. This brings me to consider how far we may expect to meet this unavoidable demand for even higher tensions with the three-phase generator.

Considering the state of things as they are and are likely to be in the course of this new century, I do not think that the limit for the voltage will be set by the generators. If the worst comes to the worst, the use of step-up transformers is always open to us. Personally, I do not consider the use of such transformers justifiable. There are already a sufficiency of sources of loss in the three-phase system without our voluntarily increasing them.

I would not hesitate to build an alternator generating at 25,000 to 30,000 volts. We have the means at hand to do it, and it is quite possible to take precautions for reducing the risk to attendants in the same degree as is being daily done in the case of other dangerous tensions. To consider a higher voltage would, to my mind, be idle, as this limit is set by the transmission line.

Taking the bare wire overhead line first, although any such thing is out of the question in this country, we are indebted for some of our knowledge on this point to the daring experiments carried out by the Westinghouse Company on some of their installations in California.

Basing my deductions on these and some personal experience with extra high tension, I

consider that we are not likely to adopt a voltage exceeding 30,000. I grant that it will be possible, under specially favorable climatic conditions such as obtain in some parts of California, New Zealand, and perhaps some few other favored spots, to work with a higher pressure, but I must doubt that such working will be sufficiently free from breakdowns to pay. In fact, as a rule, the limit stated will not be reached. Supposing that overhead transmission was permitted in England, I doubt whether our climate would allow of the adoption of much above 15,000 volts.

Quite apart from the question of whether overhead transmission at such pressures is tolerated by a country's laws or not, we must consider whether it is justifiable or not. Such tensions naturally imply great distances; it is, of course, impossible to supervise such lengths of line, and it must consequently be admitted that as soon as the line comes within easy distance of populated districts it becomes impossible. We are thus forced into one of the most difficult points to be answered. We must have recourse to cables. To my knowledge the highest pressure which has yet been transmitted by cables to any appreciable distance is well under 15,000 volts.

Will it be possible to manufacture cables which will carry currents at pressures up to 30,000 volts, such as will surely be required to give full and remunerative scope to the three-phase system in the coming century? I am aware that some of the leading Continental firms have been devoting their energies to the solution of this question.

Personally, I am unable to do more than express the hope that a good result may be obtained; the difficulties in the way are certainly great, but the ultimate result need only be reached by comparatively easy stages.

A very serious difficulty, apart from the actual cable insulation, will be met in the manholes where the cables will be split into sections. The free ends will require very special insulation in view of the dampness constantly present in such places, and the consequent possible disruptive discharges so fatal to cables.

Inductive drop is caused by the armoring of cables carrying alternating currents, and this effect would be greatly increased if three cables of ordinary construction carrying three-phase currents were bunched together. Judicious sub-division of the armoring should, however, greatly meet this difficulty.

The dielectric loss which quite lately has been again brought to our notice by Mr. Mordey's paper of January 10, must not be lost sight of, although this question when looked upon in the right light is not so very hopeless. Previous investigations, conducted on scientific lines, go to show that even with tensions of the order here suggested and such periodicity as would undoubtedly be adopted in transmissions of any magnitude, these losses, under ordinary working conditions, would not be prohibitive.

Some of the experiments decidedly point to an existing state of saturation of the dielectric; whether it is wise to go so far, is open to question. We must also bear in mind, when considering this point, that the capacity of a cable diminishes as the thickness of the dielectric increases with relation to the conductor diameter. Cables for higher tensions would, therefore, show lower capacity. A possible improvement may be found in increasing the

ing face. Pump motors can then be driven by three-phase motors as well as they now are by

haulage gears will, however, give some trouble. Installations requiring a great number of very small motors with constant speeds will preferably be carried out on the three-phase system.

In all above cases the periodicity to be adopted should be about 50, when lighting and power is to be taken from the mains, and may be reduced to suit the required motor speeds when no lighting is wanted, or when that lighting forms only a small percentage of the whole and need not be very steady, as is the case in pits. A very large field of usefulness is open for this system in the electro-chemical industry: many processes can be most successfully and very simply worked by alternating currents.

The most important development of this system is, however, to be looked for in those schemes which necessitate very high voltages:

I am strongly inclined to believe that in all cases where the line working pressure does not exceed 7,000 to 10,000 volts, it will become general practice to use a high tension motor, either synchronous or asynchronous, coupled direct to a direct-current generator, thus obviating the use of a transformer. This combination is certainly slightly less efficient, but its greater flexibility will, in most cases, amply justify its adoption.

adopted, if motors with variable speeds are necessary it need not even be considered. If, however, the source of power is very cheap and no special conditions are attached to the motor speeds, it will pay to use the three-phase system owing to its somewhat cheaper upkeep. This applies more particularly to water-power. In mines there is at present no need for this system; the performance of a good series motor on a coal cutter cannot be bettered; the distances are not so great as to necessitate a voltage higher than 500, and the presence of three cables against only two is undesirable. Later, when the pits are deeper and the galleries longer, it will pay to transmit at high alternating voltage, and transform to the elementary 500 volts, or even less, near the work-

Very low periodicities must then be the rule, and motor transformers will best supply the lighting current, whereas motors will be fed by transformed alternating currents where possible, and by direct current where necessary. Full gauge railways will use the polyphase motors, but the street cars will remain faithful to the direct current series motor.

It would appear from all this that the use of the polyphase system could not have been justified in all the very numerous cases in which it

It is the motor load which requires heavier and more expensive generators, and which lowers the efficiency of the line, owing to the wattless current which it requires. I fear that in this respect there is little hope for improvement. The motor power factor may be somewhat bettered, but I see no chance of bringing it to unity. The recent tendency, and a perfectly justified one, to construct these motors with air-gaps offering greater security from breakdowns, only tends to make the power factor worse. Anyone who doubts the reality of the danger of breakdown, due to smallness of air-gap, need only examine the strikingly stiff bearing construction adopted by the leading firms.

Then, again, the three-phase motor is bound to a certain number of widely spaced speeds,

has been applied, since the conditions for which it is best suited have only been met with very occasionally up to now. I think there is no doubt that this is so, and the reason is not far to seek.

A very great percentage of the installations

chronous converters for supplying continuous current to the railway feeders.

Direct current series railway motors have been considered by them as the only practical means at present at hand for extensive railway systems.

current railway motors and controlled by the methods at present extensively used.

The foreign engineers have, however, made a new departure in omitting the rotary converters and supplying the polyphase current directly to the motors operating the trains.

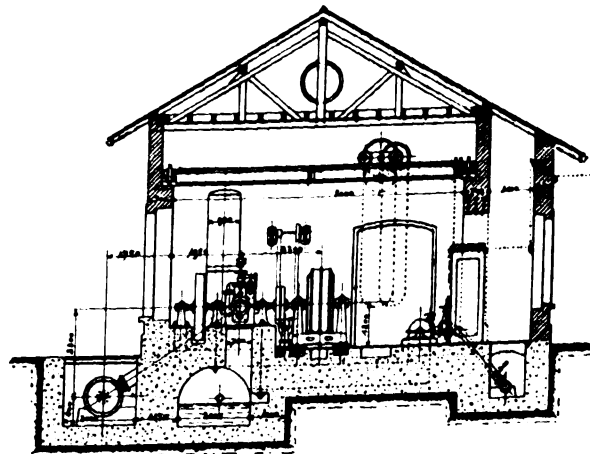
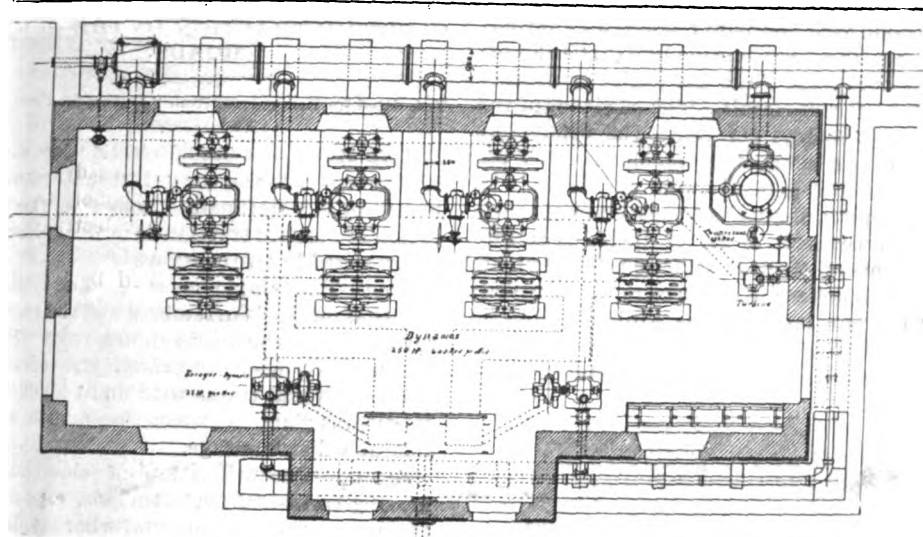


FIG. 2.—PLAN AND ELEVATION OF POWER HOUSE OF GORNERGRAT POLYPHASE RAILWAY.

worked on this system depend on water for their motive power. Efficiency is, therefore, a secondary consideration, and the choice of the simpler though less efficient system is then justified on the score of cheaper maintenance. The maintenance of a three-phase plant, as compared with a direct-current plant, was some years ago considerably less; the latest improvements in direct current machinery go far to reduce the difference.

For the rest, allowance must be made for the irresistible attraction of novelty, which I am sure was responsible in many cases for the preference given to the polyphase system.

Many other installations are simply due to the fact that smaller firms are apt to follow the lead of some of the larger concerns, without, perhaps, closely differentiating between the conditions of their own case and of those they are following.

In conclusion, I think we may fairly predict that the greater proportion of the large work done in this century will be carried out on the polyphase system. The above remarks, of course, apply to a great extent to two-phase working; the three-phase system has, however, a slight advantage, since the copper required for the transmission line is less

In every installation the polyphase alternating current being supplied from a central generating station, transmitted at high poten-

By the omission of the rotary converter from the system and the direct use of three-phase motors in the locomotive, it was found that

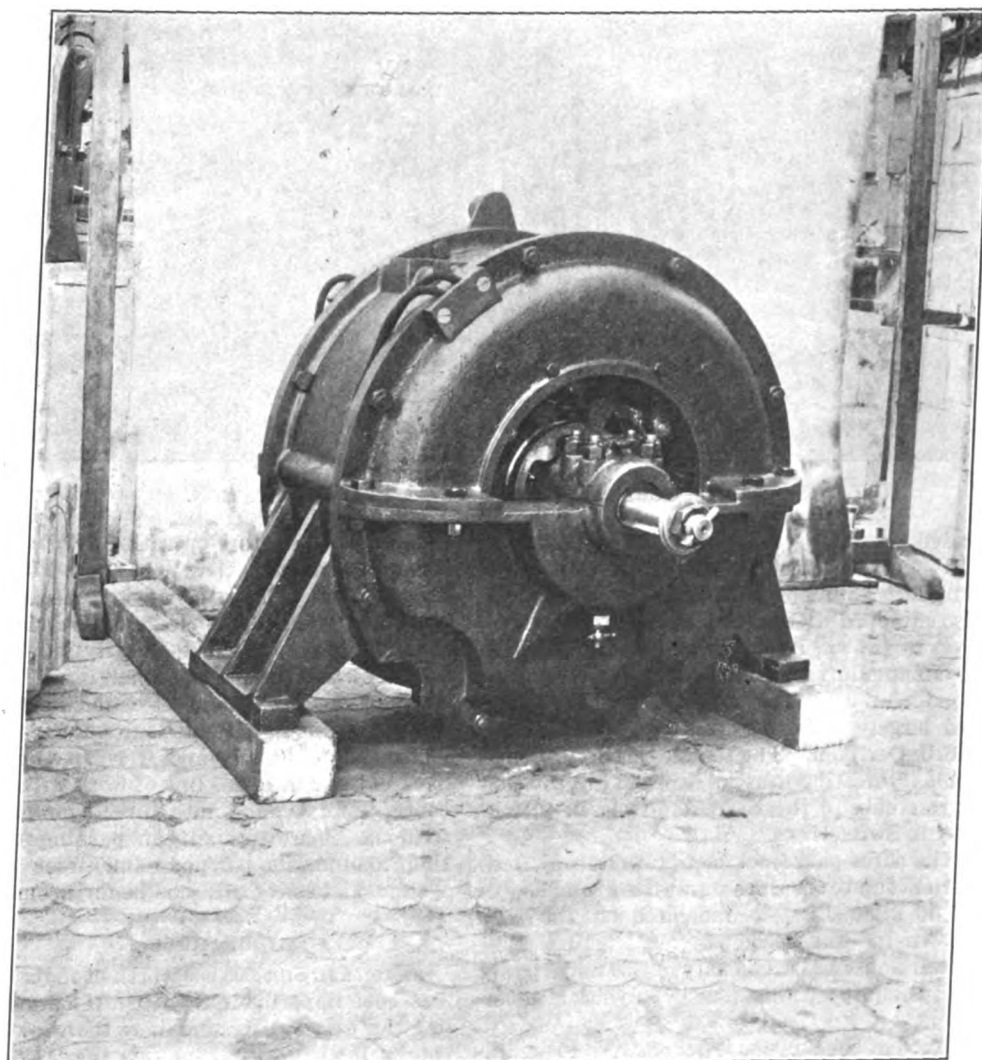


FIG. 3.—MOTOR FOR GORNERGRAT ELECTRIC RAILWAY LOCOMOTIVE.

tials to sub stations, and thereafter a reduction in potential by step-down static transformers and converted to a direct current by rotary transformers, is utilized by the direct

the cost would be only two-thirds of the amount required for introducing the direct current system.

This short serial in four numbers of ELEC-

I.—POLYPHASE ELECTRIC RAILWAYS IN EUROPE.

BY FRANK C. PERKINS.

The operation of electrical railways by polyphase alternating currents is a comparatively new undertaking. The Maschinenfabrik Oerlikon, whose large plant is located near Zurich, Switzerland, has been extremely energetic in the introduction of this class of machinery. One of the most important installations recently completed by the engineers of this company is that of a railway system to the summit of the Jungfrau in the Swiss Alps. Polyphase alternating currents have not been extensively used in America for operating railway apparatus and are considered by most American engineers as still experimental, except in cases of transmission of power with the use of syn-

TRICITY will take up four European railways which have already adopted the polyphase motor for electric traction, using this type of motor directly upon the locomotive. While up to the present time it has been used almost exclusively for mountain roads, it is now in keen competition with the combined direct current systems and polyphase system using rotary converters, and there is great interest taken in the outcome of the competition for equipping the London Underground Railway. Ganz & Company of Buda-Pesth has placed the lowest bid at one million and a half dollars, the polyphase system being cheaper to install on account of the doing away entirely with the synchronous converter and for other important reasons.

The first polyphase road illustrated is that of the "Elektrische Zahnradbahn auf den Gornergrat." The electrical equipment for this road was supplied by Brown, Boveri & Cie of

frame two 90 horse power three-phase motors of the type shown in Fig. 3. Each of the locomotives draws two passenger cars and makes the trip to the mountain top, landing its passengers at the station Gornergrat, seen in Fig. 4. A telephone line is arranged the whole length of the road and instant communication is possible with the power house and various stations. The high tension line carries a current of 5,000 volts, while the trolley or contact line is a 500 volt circuit. The efficiency of the motors is about 91 per cent., the conductors about 95 per cent., the transformers 96 per cent., and the generators 92 per cent. The electrical installation as furnished by the firm of Brown, Boveri & Cie of Baden is said to have given excellent satisfaction. The primary of the step-down transformers is 5,400 volts and the secondary 540 volts while the capacity of the three is 180 kilowatts. The electric locomotives weigh about 10.5 tons, and the nine-

extending its application to various new lines of industry. Northern Brazil, Southern Mexico, the West Indies, Central Africa, India, the Straits Settlements and the Dutch East Indies supply this increasingly important feature of our importations.

ELECTRIC TRACTION ON THE GERMAN ROADS.

Translated for *ELECTRICITY* from "Journal des Transports," Paris, France.

If we except the use of electric locomotives for towing boats and the unfortunate results attained by the Heilmann locomotive, the application of electric traction to ordinary lines may be arranged in two captions.

First—The employment of short electric trains as on the Wurtemberg and the Palatinat lines and also the road running from Milan to Monza. In such instances the service requires frequent trains with light loads, which conditions place the steam locomotive at considerable disadvantage.

Second—The utilization of electricity for moving trains through tunnels, especially at the entrance of a large city, where it is quite desirable to evade the inconvenience of smoke and soot, without closely considering the economy of such an installation. Such cases of electric locomotives may be cited as the Baltimore & Ohio tunnel and also that of the Orleans line and of the Quai d'Austerlitz to the Quai d'Orsay.

The experiments made at Berlin on the line running from Wannore, over a distance of 12 kilometers between Berlin (Potsdam station) and Zehlendorf marks a step in advance, in this respect, that they were made on a much frequented suburban line, with trains weighing about 220 tons, to which electric traction is to be applied according to ordinary practice.

We will add, however, that it is only a trial and that electric traction will be applied to a certain number of regular trains running on time schedule, and also that steam traction is to be retained for all other trains and employed to assist in case of disarrangement to the electric system.

Whatever may be the outcome of this experiment, the attempt is the most interesting and we believe that our readers will be concerned in the following information relating thereto, which we borrowed from the official journal of the German United Railways.

The installation was the work of the Siemens and Halske Company, of Berlin; power is taken from a station constructed by that firm at Gross-Lichterfeld for the railway system at that locality. The station is built at a distance of two kilometers from the railway line and furnishes the necessary electric energy at 750 volts continuous current, which is carried to a railway station at Steglitz, 68,500 meters from Berlin. To compensate for the variations in the consumption of the current, electric accumulators have been placed at the two extremities of the road, Berlin and Zehlendorf; the batteries are made up of 311 and 318 elements of the type ES 44, manufactured by a storage battery manufacturing company at Berlin; the maximum charging current is 500 amperes with a capacity of 814 ampere-hours for a discharge of one hour and 1,138 ampere-hours for a discharge in three hours.

The current is furnished at the station by a dynamo having an interior pole construction,

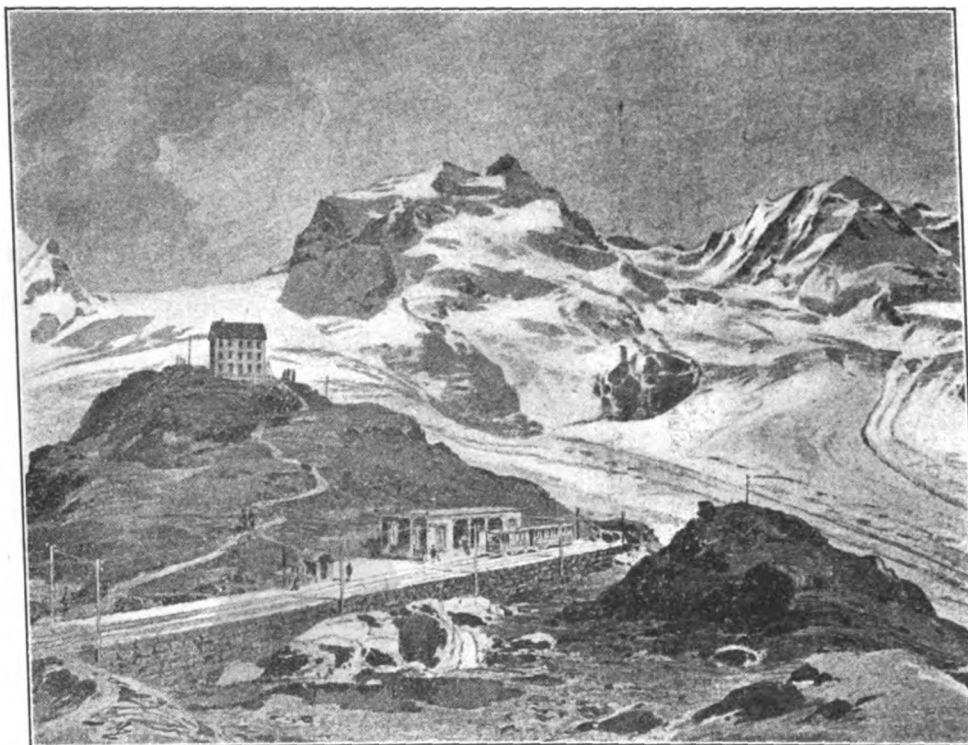


FIG. 4.—GORNERGRAT POLYPHASE RAILWAY STATION.

Baden. In the second serial an illustration and short description will be given of the Burgdorf-Thun polyphase railway, which was also equipped with three-phase electric locomotives by Brown, Boveri & Cie. The third serial in *ELECTRICITY* will contain details of the wonderful Jungfrau polyphase road, equipped largely with apparatus of the Maschinenfabrik Oerlikon. The fourth serial will have some interesting illustrations and information in reference to the Stansstad-Engelberg Railway in Switzerland.

The three-phase rack mountain railway from Zermatt up to the Gornergrat has a total length of 10 kilometers, as indicated on the map shown in the accompanying Fig. 1. The power house has a capacity of 750 horse power and is equipped with three polyphase generators.

Each of the polyphase generators of the Gornergrat railway power house has a capacity of 250 horse power and is directly coupled to horizontal shaft turbines, as indicated in plan and elevation of power house in Fig. 2. The road is equipped with three polyphase locomotives, each of which has mounted upon its

ty horse power motors operating at 800 revolutions give the locomotive speed about 7 kilometers per hour. The polyphase system seems to be peculiarly adapted for inaccessible and high mountain roads, as will be clearly seen in the review of this serial. Whether it will be extensively used for general electric traction is a question which will undoubtedly soon be solved, for the Swiss and German engineers have entered into this line of work with great energy, and coming into direct competition with the American engineers pushing forward their combination polyphase and direct current system, an answer will soon be forthcoming.

India Rubber.

More than \$100,000,000 worth of india rubber has been imported into the United States during the past 4 years, and more than \$60,000,000 worth in the last 2 years, says the "American Gas Light Journal." A decade ago the annual importations of india rubber amounted to about \$15,000,000; now they exceed \$30,000,000, and are steadily increasing. Practically all of the importations of rubber come in crude form for use of manufacturers, who are constantly

directly coupled to a compound condensing engine of the Borsig type: the dynamo gives a current of 450 amperes at 718 volts, but the current may be carried up as high as 600 volts. Automatic circuit breakers prevent the current reaching a dangerous limit, which might accidentally occur through short circuits.

There is a double distributing feeder for each track to meet the requirements of so heavy a current as is required to operate trains of 220 tons, and each of them is in the form of a low rail placed between tracks, at a distance of 1.57 meters from the center of its corresponding track and .32 meter above the top of the track rails. These conducting rails are mounted on porcelain insulators which are placed at intervals of 4 to 5 meters apart; copper connecting rail bonds are employed to minimize the rail resistance, and guard planks are used to prevent danger to life from accidental contact with the conducting rails.

The return current is taken back to the station by means of the track rails, which are also furnished with copper connecting bonds of high carrying capacity. These track rails are also cross bonded from one rail to the other at suitable distances.

The electric train can carry 410 passengers, representing a total weight of 220 tons. The average speed is 45 kilometers, but a speed of 55 kilometers per hour can be attained and there is a third class car at the front and at the back end of the train, each of them being furnished with three axle motors. This duplication of motor cars prevents changing at the end of the line and also allows of current interruptions when switching. The motorman is placed in the front car and between the two motor cars are intercalated eight ordinary suburban cars. A conducting wire is placed under the train to supply current to the two motor cars, and in case of necessity to a third motor car placed in the center of the train, while a second conductor connects all the motors in such a manner as to permit of their being simultaneously controlled.

Each motor car carries three electric motors directly mounted on the wheel axles; no current above 200 amperes can reach them, and there is such an arrangement of parts in the construction that in case of break-down the two groups of motors cannot be operated except successively, and they cannot be connected in parallel circuit except when the speed is above 20 kilometers per hour.

The general appearance of the train is the same as that of an ordinary train without a locomotive, and it is furnished with Westinghouse air brakes, but an attempt should be made to use electric brakes. The whistle has not been abandoned, for in this case it is operated by compressed air; incandescent electric lamps are used for lighting and they are fed directly from the feeder mains, and finally, small vertical heaters are placed in the motor cars to furnish steam for heating purposes.

During the trial tests observations will be made on the following points:

A—Production of electric current.

1. Automatic registration of consumption in watt-hours.

2. Determination of the fall of potential.

B—Motor cars.

a. Electric meter readings to be made during each trip to determine current used in watt hours.

b. For different trips.

1. Determination of the current consump-

tion and the taking of speed diagrams between each of two stations.

2. The taking of diagrams of the current strength, its voltage and work performed in getting under headway and in stopping up to the time the brakes are applied.

3. Diagram of power used for braking purposes.

4. Determination of the lateral movements of the motor cars.

5. Determination of the effect on the train by the modifications in the incoming current and by throwing the motors out of circuit.

6. Determination of the wearing on the motor car wheel tires.

C—Accumulators. Daily expense of current.
D—Generalities.

1. Expense of maintenance for current conductors and of the total electric equipment.

2. Cost of oils and waste.

3. Expenses of electric train lighting.

4. Expenses for heating.

5. Expenses of the personnel.

6. Cost of taking care of the train other than the electric equipment.

E—Taking of data from a similar train drawn by an ordinary locomotive for comparison.

1. Expenses for fuel.

2. Expenses for water.

3. Cost of locomotive maintenance.

4. Cost of oil and waste.

5. Cost of lighting.

6. Cost of warming.

7. Wages of help.

8. Expense for taking care of the train other than the locomotive.

9. Wear on locomotive wheel tires.

Whatever may be the result of this undertaking it is certain that it will be a source of the most interesting information, and there is no need for our saying that these experiments will be closely watched.

The Metric System.

It looks as if Congress, at last, is going to go on record for giving the country an indication of far greater intelligence than is usually put down to the credit of that body. It is to pass a law making the metric system the standard of weights and measures. Anent this bill we have read, in technical papers, some editorials that rank, for linguistic, almost logarithmic density with any ever furnished for the fun of involutioned absurdity by Mark Twain at his best. One paper talks of Germany still using Whitworth and Stubb wire gauges, "for the simple reason," it says, "that aliquot even sub-divisions, according to the multiples of two, using the inch as a standard of length, seem to come out nearer what is desired in practice than any decimal multiplication or sub-division of any of the metric units so far attempted." What does that mean? Does the metric system do away with two or one, or three or any unit? Germany keeps the Whitworth and Stubb, because it bought them so long ago and sticks to them so closely that it cannot or will not give them up. But for the one argument against the metric system in this country Germany had thirty. There was a different kind of measure in thirty different parts of the empire. If we are wise we will not neglect a system almost universal, and sure to be, in its use. It

is all nonsense to say our people will be bothered by terms. It is as easy to learn the names in the metric system as in any other. If a kilogramme is a trifle more than two pounds, half a kilo, is a trifle more than a pound. A meter is 39 inches, an inch is a thirteenth of a meter, where now it is a twelfth. A mile is 1,000 times a meter, or a thousand times three thirteen-inch feet. Why was 13 inches called a foot? It is no harder to think of a 39-inch standard than of a 36-inch one. If we adopt the metric system, we will win our way easier in foreign markets. If we don't, we won't. That is reason enough for its adoption.

By adopting the metric system of weights and measures, we only put ourselves in line with most of the world. England and we are the only nations not under this most sensible of all systems. Like it or lump it, if we are to hold our own, to say nothing about making gains in foreign markets, we shall have to go over to decimals in weights and measures. It will pay too. For the dollar lost by doing so, thousands will be lost by delay. The commerce of the world will be carried on in decimals. When one thinks of what it meant to Continental Europe to give up their old systems for the metric, we can hardly help laughing at the lame or limping excuses given here and in England for not adopting it. A good and wise way to begin the twentieth century would be to adopt the metric system. The Philadelphia "Manufacturer."

SOLDERING ALUMINUM.

BY JOSEPH A. STEINMETZ.

Upon attempting, with any ordinary solder, to join sheets of the metal, it is noticeable that the mixture does not take hold, but tends rather to run off, or perhaps it will chill, utterly refusing to tin the sheets, and rarely adhering to the aluminum. The reason of this behavior is that there is always present a thin, continuous coating of oxide, which effectually prevents the solder from getting to the true metal beneath. This thin, almost invisible, skin of alumina, or oxide of the metal, is of instantaneous formation, and the surface of the metal may be scraped or filed without even temporary relief because of the immediate renewal of the coating.

The use of fluxes and acids to overcome this difficulty have been repeatedly suggested, without securing satisfactory results, and a new theory tending toward the solution of the problem must needs be approved. Dr. Joseph W. Richards, of Lehigh University, Bethlehem, Pa., conceived the successful practice of overcoming the difficulty by incorporating into the composition of the solder an ingredient that would remove the oxide film during the process of soldering, thereby preserving the surfaces clean until the union of the parts had been accomplished. The solder devised and patented by Dr. Richards carries in its make-up an alloyed flux of phosphorous in tin, the theoretical necessity of the simultaneous action of the flux and the taking hold by the solder being confirmed during many years by the satisfactory results obtained in actual commercial practice.

The high heat conductivity of aluminum is another characteristic of this strange metal, and the refusal of many solders to perform their expected duty is traceable to it. The aluminum quickly and readily absorbs the heat from the soldering iron, and the temperature

of the tool is thus so far reduced that the solder "freezes" at the joint and failure ensues. To overcome this difficulty, which arises in large work particularly, it is necessary to keep the soldering iron very hot, and oftentimes it tends to the betterment of the result to apply heat likewise to the parts to be joined.—"Cassier's Magazine" for March.

Durability of Copper Alloys in Sea Water.

In order to determine whether the durability of various copper alloys in contact with other alloys and metals in the presence of sea water could be foretold from their relative positions in the electromotive series, a number of tests were carried out in the following manner:

The bars to be tested were prepared of a shape similar to that of ordinary test bars, and several being cut from one plate or casting, three of them were tested for strength and extensibility. The results of these tests formed a basis of comparison, the effect of the sea water being judged from the lowering of strength and ductility in the bars which had been immersed. This method of estimating the depreciation was selected because in very many cases the external appearance of a bar remains unaltered, although in reality its structure may have undergone considerable change, and also because the diminution in weight does not give a correct indication of the deterioration in strength.

The bars to be tested were riveted to plates of the different metals and hung in sea water for periods varying from eight months to two years. It was found that the bars suffered considerable injury only when they were in contact with an electro-negative metal, the destruction being more complete the greater the distance apart of the metals of the plate and bar in the series. Those bars endured best which were riveted to plates of metal that were high in the electromotive series. In fact, an electro-positive metal exercises a preserving influence on an electro-negative metal. This was proved in the experiments from the fact that those bars which had been riveted to iron plates or to metals of such composition as yellow metal, naval brass, etc., preserved their qualities much better than those in contact with any other metal. Pure aluminum bronze (91 copper to 9 aluminum) neither itself suffered a rapid destruction when in contact with an electro-negative metal, nor did it induce anything like so quick a deterioration of an electro-positive metal as copper or tin bronze, which proved themselves the most destructive of other metals in contact with them.—Inst. C. E.: Foreign Abstracts.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended February 13:

Antwerp, 2 packages, \$143; Argentine Republic, 36 packages, \$3,351; 3 cases, \$332; Australia, 179 packages, \$10,443; 48 packages electric car material, \$9,917; Barcelona, 8 cases, \$566; Bilbao 1 case, \$30; Bremen, 4 packages, \$401; British East Indies, 19 packages, \$500; British Possessions in Africa, 1,003 packages, \$35,113; British West Indies, 57 packages, \$2,403; 2 coils cable, \$968; 6 cases electric motors, \$227; Central America, 212 cases, \$501; China, 12 bundles, \$505; Cork, 20 packages motor trucks, \$1,300; Cuba, 88 cases, \$2,339; 6 packages, \$550; Ecuador, 1 case, \$23; Florence, 5 cases, \$366;

Genoa, 120 packages, \$12,658; Gibraltar, 5 cases, \$115; Glasgow, 49 packages, \$475; 8 cases, \$1,600; Hamburg, 35 packages, \$5,657; Havre, 41 packages, \$1,972; Japan, 198 cases, \$41,808; 44 cases motors and parts, \$3,528; Korea, 147 packages, \$18,888; Liverpool, 132 packages, \$24,956; London, 447 packages, \$39,647; 28 packages motor vehicles and parts, \$14,075; Madrid, 2 packages, \$67; Manchester, 13 cases, \$2,680; Marseilles, 2 cases, \$225; 44 bales, \$385; Mexico, 96 packages, \$2,153; Milan, 33 packages, \$2,400; Naples, 1 case, \$719; Philippines, 12 cases, \$1,388; Reval, 30 cases electric fans, \$403; Santo Domingo, 8 packages, \$891; Siam, 3 cases, \$329; Southampton, 11 cases, \$800; St. Petersburg, 22 cases, \$251; Tasmania, 4 packages, \$94; U. S. Colombia, 4 cases, \$59.

New York Electrical Society.

The 212th meeting of the New York Electrical Society was held on February 14. Mr. Kempster B. Miller lectured on "Modern Telephone Engineering." Mr. Miller discussed very fully the equipment of the telephone exchange, its functions, and many important engineering problems connected with it. Mr. Miller also exhibited a number of curves, which were of the greatest interest, and in many ways threw important light on improved telephone practice, about which there has been a lack of information in recent years. The lecture was greatly enjoyed by a large audience.

Mr. T. C. Martin, President, announced the election of Mr. C. E. Knox as Vice-president, to take the place of Mr. W. C. Burton, who has resigned in consequence of his continued stay in England.

The following members were elected: A. L. Orton, Munson D. Atwater, Walter L. Thompson, Frank B. Rae, William Kent, A. B. Eads, Jas. R. Strong, Wm. B. Osgood Field, E. L. Elliott, J. M. Wakeman, David Killock, New York City; E. R. Lever, Newark, N. J.

PERSONAL MENTION.

Mr. S. Ichikawa, chief electrician of the Hokkaido Coal Mining & Railroad Company of Japan, has been on a tour of inspection in this country with a view of learning coal mining by the use of machinery, as he expects to install electrical mining machinery in his mines.

Mr. Harry W. Fuller, who was lately appointed by President Allan L. McDermott to the office of general manager of the Washington, D. C., Traction & Electric Company, has accepted his new position.

Mr. Otto W. Meysenburg, the president of the Rodger Ballast Car Company, also of the Siemens & Halske Electric Company of America, and ex-president of the Wells-French Car Manufacturing Company, died last week at Alma, Cal., of typhoid fever. He was 52 years old.

Mr. W. B. Worthington, chief engineer of the Lancashire & Yorkshire Railway of England, with J. T. Tatlow, locomotive accountant of the same railway, were in Baltimore, Md., a short time ago inspecting the electric equipment of the Belt Line of the Baltimore & Ohio, and studying the accounting methods of the road.

Mr. Richard Stockton of Trenton, N. J., has succeeded Mr. Charles Watson as manager of the South Jersey Gas, Electric & Traction Company at Mount Holly, N. J.

Mr. R. E. Slade, formerly of White Plains, N. Y., has accepted the superintendency of an electric plant at Lockport, N. Y.

INCORPORATIONS.

The Citizens' Electric Light, Power & Heating Company, Shreve, O. Capital stock, \$10,000.

The Spring River Electric Power Company, Kansas City,

Mo. Capital stock, \$50,000. Incorporators: F. O. Chesney, F. L. Chesney and E. C. Chesney.

The International Brass & Electric Company, New York City. Capital stock, \$25,000. Directors: Gustave Huerstel, R. A. Scott and Edwin Huerstel of New York City.

The Huntington Electric Light, Heat & Power Company, Huntington, Ark. Capital stock, \$8,000. Incorporators: W. Harper, M. Hayes and J. H. Thompson.

The Sussex Light & Power Company, Trenton, N. J.—to carry on an electric light and power business. Capital stock, \$500,000. Incorporators: F. J. Myers, Hillsdale, N. Y.; R. H. Batchelor, Piscataway, N. J.; A. T. Rice, Rutherford; William Duncan and William J. Schneider, New York.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED FEBRUARY 12, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

667,730. Electric Brake Mechanism. Frank C. Newell, Chicago, Ill., assignor to the Westinghouse Air Brake Company, Pittsburg, Pa. Filed Aug. 26, 1899.

667,730. Electric Brake. Frank C. Newell, Wilkensburg, Pa., assignor to the Westinghouse Air Brake Company, Pittsburg, Pa. Filed May 2, 1900.

667,764. Electric Switch. David R. Bruce, London, Eng. Filed July 28, 1900.

667,868. Trolley Mechanism. John H. Cook, New York City, assignor to Henry B. Newhall, Plainfield, N. J. Filed July 7, 1899.

667,908. Trolley-Switch. Charles P. Cornell, Baldwinsville, N. Y. Filed June 29, 1900.

667,904. Closed Conduit Electric Railway. Leon Dion, Boston, Mass., assignor to the Electrical Safety Traction Company of West Virginia. Filed Aug. 6, 1900.

667,906. Elevated Electric Railway. Lewis A. Brown, St. Louis, Mo. Filed Oct. 22, 1900.

667,979. Street-Car Fender. George W. Gardner, Philadelphia, Pa. Filed Oct. 31, 1900.

668,057. Trolley Wheel. Francis E. Shaughnessy and George J. Thomas, Newton, Mass.; said Shaughnessy assignor to Thomas C. Knowles, same place. Filed July 17, 1899.

ELECTRIC LIGHTS AND APPLIANCES.

667,980. Terminal Socket. Ernst W. G. C. Hoffmann, Charlottenburg, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Oct. 11, 1899.

ELECTRICAL MACHINERY AND APPARATUS.

667,986. Transformer. Ferdinand Schwedtman and Waldo A. Layman, St. Louis, Mo. Filed June 4, 1900.

668,030. Means for Stopping Electromotors. James J. Wood, Fort Wayne, Ind. Filed Oct. 15, 1900.

668,140. Rheostat and Circuit-Breaker. Henry B. Cutter, Philadelphia, Pa., assignor, by means assignments, to H. Ward Leonard, New York City. Filed Feb. 24, 1899.

TELEPHONES AND TELEPHONE APPARATUS.

668,022. Signal Controlling Relay. Herbert E. Shreeve, Dedham, Mass., assignor to the American Bell Telephone Company, Boston, Mass. Filed Oct. 1, 1900.

668,044. Telephone Switchboard and Circuit. Francis L. Gilman, New Bedford, and Charles H. Herzog, Boston, Mass., assignors to the New England Telephone & Telegraph Company of New York. Filed Nov. 6, 1900.

MISCELLANEOUS.

667,727. Automatic Alarm System. Felix McGiloin, New York City, assignor to the Automatic Fire Alarm Company, same place. Filed May 21, 1900.

667,805. Signaling Apparatus. William A. Swann, Chicago, Ill., assignor of one-half to Hamilton C. Kibbie, Oblong, Ill. Filed Jan. 2, 1900.

667,859. Ship's Telegraph. Frank W. Wood, Newport News, Va. Filed July 11, 1900.

667,875. Running Gear for Vehicles. William L. Garrels, St. Louis, and Clinton Kimball, Kirkwood, Mo., assignors to the Electric Vehicle Company, New York City, and Jersey City, N. J. Filed Dec. 29, 1899.

667,882. Feeder Wire Insulator. Charles K. King, Mansfield, O. Filed Dec. 5, 1900.

667,849. Electric Spark-Coil. Stephen B. Morse, Rahway, N. J. Filed March 21, 1900.

667,958. Alarm Apparatus. Rudolph Segerdahl, Chicago, Ill. Filed Sept. 2, 1899.

668,108. Transfer Apparatus for Electric Batteries. Cyprien O. Mailloux, New York City. Filed Dec. 29, 1899.

668,109. Storage and Transfer System for Electric Batteries. Cyprien O. Mailloux, New York City. Filed April 24, 1900.

DESIGNS.

34,084. Bracket for Telephone Stands. Ray V. Griggs, Chicago, Ill. Filed Nov. 5, 1900. Term of patent 7 years.

34,086. Support for Incandescent Mantles. Max Herakowitz, Chicago, Ill. Filed Jan. 18, 1901. Term of patent 7 years.

THE TELEPHONE WORLD.

The Bell's Low Rate.

The cheapest telephone contract ever made by Charleston, S. C., with the Bell Company has lately been closed, by which the Bell Company has agreed, for a term of three years, to operate all the city 'phones at the rate of \$4 a year. The city contract calls for about twenty 'phones. Bids were asked from the Bell and Gordon, the independent company, and a regular cut-throat business was begun. In order to get the contracts, the Bell offered to do the work for the figure named, and the city took up the offer. Rates of this kind do not go to outsiders, however, and this cheap rate was made simply to get the business. The Bell people say they are losing money by the deal, but preferred to lose rather than have the "official" business go to its rival. An effort has been made to stir up trouble over the contract, but it was made in due form and was ratified by council.

The two companies were requested to make bids for a one-year and a three-year contract. It is understood that the Gordon's offer was \$20 a year for the three-year contract, and the Bell Company was chosen because of its low rates.

The telephone franchise granted the United States Telephone Company of Cleveland by Jackson, Mich., has been accepted and the company will establish a toll office in the business section of the city. A recently constructed line extends from Bay City via Saginaw, Lansing, Jackson and Adrian, to Toledo, where connection is made with its Ohio system. It will also connect with a great number of rural systems which the Bell Company has shut off.

Papers have been made out for a corporation with a capital of \$5,000 to establish a telegraph and telephone line from Lakeview to Silver Lake, via Crooked Creek, Paisley and Summer Lake, Ore., a distance of 100 miles. It is also proposed to wire Lakeview for a local telephone system. The enterprise will be of great benefit to Lake County.

The towns of Riley and Leonardville, Kan., are each to have a local telephone exchange with a toll line connection. The work of construction has commenced. Each of the towns has a population of about 300. Telephone promoters of Central Kansas are so eager to extend their operations that many of the little towns of 150 to 500 are given exchanges.

The Pratt City, Ala., exchange of the Southern Bell Telephone Company will be remodeled in a short time. Telephones of the long-distance kind like those in use in Birmingham, Bessemer and Ensley exchanges of that State will be substituted for those now in use and the service otherwise improved.

The Citizens' Telephone Company, the proposed new company for Memphis, Tenn., last week filed a formal application with Mayor Williams, seeking a permit to begin its construction work at once. Should the city council take favorable action on the matter, the company will begin work not later than the middle of this week.

The telephone system at Red Spring, N. C., changed hands a short time ago, and the new owner put up prices. As a result a nearly complete boycott is in effect, as all but three 'phones have been grounded.

The telephone war in Buffalo, N. Y., has taken on a new phase. A company known as the Jamestown & Chautauqua Telephone Company, and composed entirely of local capitalists, has applied for a franchise. This makes three applicants for favors at the hands of the common council and that body is wrestling with the problem.

The Port Jervis, N. Y., Telephone Company recently decided that it was necessary to increase the capital stock from \$8,000 to \$15,000. Cables are to be put in and new wires raised for the accommodation of new subscribers.

The most important business to come before the Duluth, Minn., board of county commissioners recently was the consideration of the petitions from the ranges for telephone service with the court house. O. D. Kinney made a strong plea in favor of the proposed telephone communication.

A bill regulating telephone rates in cities of the first class at 14 cents for the use of any telephone for five minutes has been introduced in the Legislature at Albany, N. Y., by Assemblyman Scanlon.

The Home Telephone Company of Cortland, N. Y., has issued a new list of subscribers which contains 310 names, exclusive of the Homer exchange.

Michigan's Favorable Independent Telephone Report.

The managers of the independent telephone exchanges of Michigan met in Lansing a short time ago under very favorable circumstances. At the time of the last annual meeting the Erie Telephone Company had just purchased the Detroit independent lines and was reaching out after other exchanges to such an extent that the independent managers were getting nervous, but now the prospect is brighter. Every exchange represented at the meeting reported a growing business, and it is stated that the prospects of the independent companies never looked brighter. The day was spent in discussing rates and transacting business of interest only to the members of the association. The association will hold a meeting next August in Alma.

The following officers were elected: President, J. B. Ware, Grand Rapids; vice president, Orrin Morrow, Benton Harbor; secretary, C. F. Brown, Alma; treasurer, J. H. Fildew, St. Johns; executive committee: J. R. Hyde, Hart; W. O. Hunt, Adrian; C. W. Gale, Owosso; R. F. Johnson, Saginaw.

At a recent meeting of the Le Roy, N. Y., village board Milton H. Wade of Franklinville applied for a franchise to erect poles, string wires and maintain an independent telephone exchange. President Huyck appointed a committee consisting of Trustees Lapp, Rogers and Heaman to look the matter up and report at the next meeting. There are at present about 150 Bell telephones in use in the village, for which residences are charged \$1 per month. Mr. Wade stated that the telephones would not exceed 75 cents per month for residences and \$1.25 for business places.

The Gainesboro Telephone Company, which completed long-distance connections in Carrollton, Ga., last fall, and which has extended its service to Bremen and later to Bowdon, Ga., has finished connections to Victory and Tyus, two important country points in that State, and have begun to extend from Bremen to Waco and possibly will immediately continue to Tallapoosa. It has arranged to start a line to Buchanan, the county seat of Haralson, twenty miles north of Carrollton.

The Hudson River Telephone Company of Albany, N. Y., will hold a special meeting of stockholders on March 7, to increase its capital stock from \$3,000,000 to \$4,000,000, to be used for construction and betterment. The proposed new capital will not all be used at once. The company now covers a vast territory, extending from Westchester County to Utica, and from Albany to Montreal, Canada. The annual meeting of the company will be held on the same date.

The Baiting Hollow, N. Y., Telephone Company has been organized. The officers elected for the new company are E. E. Mosier, president; John C. Young, secretary and treasurer, and Charles Warner, manager. Other directors are: W. V. Young, George F. Terry, Henry Talmage and Eckford Hallock. The company will start with a capital stock of \$1,000. The line will run from Baiting Hollow east, a distance of six miles, and on to Riverhead village, making ten miles in all. The promoters will put in the best telephones they can buy and will start with a good number of subscribers. They hope to have the system working by April 1. The line will be a great convenience to the farmers along the route. The rate has not yet been fixed.

The Standard Telephone & Telegraph Company has been granted franchises in Langhorne, Pa., and work is to be started immediately toward installing a complete system. This company will also extend its line to Quakertown, Sellersville, Hatboro, Ivyland, Forest Grove and Bristol in that State, thus making the independent service very complete in Bucks County.

J. Lowber Welsh, John D. Crimmins, Elverton R. Chapman, Gen. Samuel Thomas, George W. Elkins, Frank M. Riter, Randal Morgan, John C. Bullitt, Jeremiah J. Sullivan and Morgan W. Ayres have been elected directors of the Telephone, Telegraph and Cable Company of America.

A stock company has been formed in Benson, Ill., to erect and maintain a country telephone, with headquarters there, connecting with other lines already in operation. S. L. Peterson, J. E. Eckhart and Ruf Parks are all interested in the enterprise.

Application for a charter will soon be made in Salt Lake City by the new company known as the Salt Lake Mutual Telephone & Telegraph Company.

The Missouri Kansas Telephone Company is extending its long distance line to a number of places south of Nevada, Mo.

A Bill to Prevent Purchasing Rival Lines.

The Hon. George M. Hosack, member from the Fifth District, has introduced a bill in the Pennsylvania Legislature, the first section of which provides, "That no corporation, association, partnership or individual, owning, operating or controlling any telephone line or lines shall acquire, either by purchase, lease or otherwise, any competing line, or the controlling interest in the stock or bonds of any competing telephone line, or in any wise control, operate or own any competing telephone line, or the controlling interest in the stock or bonds thereof."

Mr. Hosack says "the object and purpose of the bill is, as the title indicates, to prevent the consolidation of competing lines for the holding of the controlling interest in the stock and bonds of competing telephone companies, for the acquisition, or control, either directly or indirectly, of one competing telephone company by another."

A charter was lately granted the Hanover and Henrico Telephone & Telegraph Company, with headquarters at Ashland, Va. The directors of the company are W. C. Saunders, E. S. Campbell, M. D. Hart, E. L. C. Scott and John G. Pollard. The maximum capital stock is placed at \$5,000, and the minimum at \$1,000. The company is authorized to do a general telephone and telegraph business, and to acquire old lines or to build new ones.

Manager McElroy, of the independent telephone system to be put in Sherman, Tex., recently said: "We expect to have the line from Denison to Houston completed and in operation in five months and expect to be setting poles and actively at work in Sherman within thirty days and to push the matter just as fast as men can do it."

The judiciary committee of the common council of Chicago, Ill., has under consideration a movement to secure an additional revenue of \$250,000 for the city. It is proposed to tax companies \$5 per pole and 15 cents per linear foot for conduits for all telegraph and telephone companies operating in that city without a franchise.

Some fifteen farmers living in the neighborhood of Branchport, Yates County, and Pulteney, Steuben County, N. Y., have established an independent telephone line. Their wire is now about five miles long. In the future it is expected the line will be extended to Branchport and Hammondsport, and possibly to Penn Yan. The patrons of the system can then keep in touch with the markets.

The New Berlin, N. Y., Telephone Company was recently organized with a capital stock of \$3,000. A switchboard for 100 'phones has been ordered and there is no doubt that as soon as people realize its convenience that number of 'phones will be installed. There are already about 50 subscribers. The rate for business places has been fixed at \$15 per year, residences \$12.

A private telephone line running a few miles south of Thorndale, Tex., for the convenience of a thickly settled farming section, will be erected soon by a number of citizens of Thorndale.

The Ansonia, Conn., Telephone Company has filed a certificate of increase of capital from \$20,000 to \$25,000.

The Independent Union Telephone Company of Batavia, N. Y., has accepted the franchise granted by the aldermen.

The Ogle County Telephone Company of Rochelle, Ill., has increased its capital stock from \$10,000 to \$50,000.

TELEPHONE INCORPORATIONS.

The Wichita & Charlie Telephone Company, Wichita Falls, Tex. Capital stock, \$1,500. Incorporators: W. D. Bently, D. E. Bently, H. T. Dunn, L. P. Amazon and C. B. Felder.

The Maquoketa Telephone Company, Maquoketa, Ia. Capital stock, \$45,000. Incorporators: H. T. Brigham, C. B. Miller, F. J. Spencer, W. H. Solin and P. A. Stuenkel.

The Keystone State Telephone & Telegraph Company, Trenton, N. J.—to construct, acquire and operate telephone, telegraph and cable lines. Capital stock, \$2,000,000. Incorporators: Norman Frey, Edward H. Clew and Wilfred B. Wolcott, all of Camden.

The People's Telephone Company of Montgomery County, Montgomery City, Mo. Capital stock, \$3,100. Incorporators: H. Ellis, New Florence; T. Marlow, Americus; W. Crane, Minnola; W. Crockett, Montgomery City and F. E. Neidergerke, Big Springs.

GENERAL ELECTRICAL NEWS.

Lighting.

Archbold, O.—This town contemplates the erection of an electric light plant.

Avoca, N. Y.—This village is discussing the question of municipal construction and operation of an electric light plant.

Canton, O.—Bids will be received until March 2 for furnishing all the necessary labor and material for providing and supplying to this city 35 or more all night arc lights of 200 candle power each, for lighting the streets and alleys. Address L. N. Ley, city clerk.

Carsonville, Mich.—The question of bonding for electric lights will be voted on next month.

Charlemont, Mass.—The money has been appropriated to light the streets and town hall with electricity.

Columbus, O.—Director Kauffman of the department of public improvements has begun the preparation of specifications for the purpose of calling for bids for lighting the city, as the present contracts will soon expire.

Cullom, Ill.—Messrs. Ortman & Fogerty have been granted a franchise to erect an electric light plant here.

Fredericktown, O.—The citizens are contemplating the erection of an electric light plant.

Greensboro, N. C.—The establishment of an electric light plant is being considered. J. M. Bandy, city engineer.

Hammondspoint, N. Y.—There is a growing sentiment in favor of electricity for street lighting here.

Hampton, Va.—The council has considered the advisability of establishing an electric light plant to be operated and owned by the town.

Hedrick, Ia.—The electric light question will be submitted to the people of this place at a special election to be held March 4.

Hogansville, Ga.—The establishment of an electric light is being considered here.

Independence, Mo.—The plant of the Citizens' Electric Light Company was recently destroyed by fire. The loss is estimated at \$5,000. It is proposed to erect a municipal electric lighting plant at once.

Johnstown, O.—An electric light plant will soon be erected here.

Jonesboro, Tenn.—This city has called an election to vote on the question of erecting an electric light plant.

Lawrenceburg, Ind.—The council has authorized the city clerk to advertise for bids for the erection of an electric light plant by the city.

Lincoln, Ill.—The council is considering the question of building an electric light plant for the city.

Live Oak, Fla.—The erection of an electric light plant is proposed and C. Y. Bird can be addressed.

Lompoc, Cal.—A movement is on foot for the establishment of a local electric lighting plant.

Ludington, Mich.—J. S. Stearns has purchased the F. Filer electric light plant in this city. The plant will be moved in the spring and new equipments added, making it a modern plant.

Manitou, Col.—A new electric light company is ready to ask for a franchise here.

Mt. Air, Ia.—W. E. Martin of Atlantic and O. S. Martin of this city have made a proposition to the authorities to put in a \$40,000 electric light plant.

Newburyport, Mass.—The city government is considering the buying of the gas and electric light plant of this place. A committee has been appointed to investigate.

New London, Ia.—The proposition to levy bonds for the purpose of erecting an electric light plant in this city will be submitted to the voters at the coming spring election.

Oregon, Wis.—J. Cramer is making arrangements to erect an electric light plant at this place.

Pennville, Ind.—This town is now figuring on putting in an electric light plant.

Perham, Minn.—The electric light plant here is to be enlarged.

Red Lion, O.—J. Decker is agitating the question of erecting an electric light plant at this place.

River Rouge, Mich.—There is talk of an electric lighting company being formed here.

Talladega, Ala.—The citizens are agitating the electric light question.

Thorp, Wis.—A movement has been started to erect an electric light plant here.

Tiskilwa, Ill.—The citizens of this place are agitating the question of building a new electric light plant.

Toledo, Ill.—Plans are being prepared for the erection of a new electric light plant here.

Youngstown, O.—The Youngstown Consolidated Gas & Electric Company contemplates the enlargement and improvement of its plant. Bonds to the amount of \$600,000 have been issued for that purpose.

Street Railways.

Albany, N. Y.—Expert Appraiser J. H. Ehrehart, of the State Board of Tax Commissioners, has a plan which contemplates using the present system of the Erie canal for the right-of-way of an electric freight railroad, to be owned by the State, that shall do the work contemplated by the proposed barge canal.

Auburn, N. Y.—The Auburn Interurban Electric Railway Company proposes to begin operations as soon as possible toward extending its line from here to Syracuse.

Bedford, Ind.—The city council has granted a franchise to the Bedford Street Railway Company to operate an electric street railway in this city.

Chambersburg, Pa.—The Chambersburg & Gettysburg Electric Railway Company has secured permission from the councils in Chambersburg to construct and operate a railway here.

Danverscott, Me.—A charter has been granted for an electric road between here and New Harbor.

Fort Wayne, Ind.—Andrew A. Purman of this city has succeeded in organizing a syndicate that will consolidate Indiana, Michigan and Ohio lines.

Kansas City, Mo.—The electric motor sweepers of the Metropolitan Street Railway are a success, having in the recent storm met every requirement.

Lawrence, Kan.—L. M. Erb of New York City will ask the city council for a franchise for an electric street railway system. Mr. Erb proposes to build over five miles of track, running the line to the State University and Haskell Institution. He says that he has capital ready to carry out his plans, provided that a satisfactory franchise can be obtained.

Louisville, Ky.—The executive committee of the Louisville, Anchorage & Pewee Valley Electric Railway Company has decided to issue bonds to the amount of \$350,000.

Montpelier, Vt.—The outlook for the speedy building of the Montpelier & Newport Road is most favorable, as the towns along the proposed line are taking an active interest in seeing the project put through.

Roanoke, Va.—A movement is on foot to secure the construction of an electric railroad from this city to Fincastle. Messrs. Benjamin Haden, Judge Breckenridge, C. W. Bowyer and W. R. Allen are interested in the scheme.

Rochester, N. Y.—A stock company, capitalized at \$3,500,000, has been formed by Rochester and New York capitalists to construct an electric railroad from this city to Niagara Falls and Buffalo, following as far as Lockport the line of the historic Ridge Road.

Springfield, O.—J. P. Martin is making arrangements for the construction of an electric street railway between here and Xenia.

Tacoma, Wash.—Two electric railroads are projected between this city and Seattle, both to be built this year. The company is composed of a syndicate of Eastern men who control the street railways of both cities.

Union, S. C.—A franchise has been granted by the city council to T. C. Duncan and associates to build an electric railway in this city.

Company Matters.

Ansonia, Conn.—It is rumored that the Russell-Tomlinson Electric Company intend to move its works out of town in the near future.

Elkhart, Ind.—The stockholders of the new Elkhart Electric Company met recently and completed their

organization. Martin Beige of Mishawak was elected president, Charles H. Tenney of New York secretary, and Charles F. Hewitt of Elkhart treasurer and general manager.

Grand Rapids, Mich.—The Michigan Electrical Supply Company has commenced operation here. J. M. Cooke and W. P. Freleigh comprise the company. This concern carries a full line of electrical and telephone supplies as well as constructing and doing all kinds of repair work.

Holley, N. Y.—The annual report of the Holley Electric Company to its stockholders for the year ended January 10, 1901, shows the company to have had a fairly prosperous year.

Milwaukee, Wis.—At a recent meeting of the stockholders of the Twin City Electric Company it was decided to change the name to the Electric & Water Company, and double the capital stock, making it \$40,000.

New York City.—At the annual meeting of the Edison Electric Illuminating Company of this city the old board of directors was re-elected.

Providence, R. I.—The power producing capacity of the Pawtucket Electric Company and the Bridge Mill Power Company is to be materially increased by the addition of a new engine and new dynamos.

Manufacturing.

Milford, Conn.—Judge Townsend has appointed Samuel L. Galpin of New Haven to be receiver of the Electrical Manufacturing Company of this place.

Montreal, Can.—The establishment of the Northern Electric & Manufacturing Company was recently damaged by fire.

Phillipsdale, R. I.—The Varley Duplex Magnet Company, formerly of Jersey City, has removed its plant for the manufacture of electrical magnets to this place. The company is to be amalgamated with the American Electrical Company located here.

Rome, N. Y.—Clyde & Dyott, proprietors of the Electrical Wire Works, have purchased ground on which to erect a fine factory for their wire drawing business.

Power and Transmission.

Fayetteville, N. C.—The outlook for the Cape Fear Electric Power Company's contemplated work, in which W. M. Morgan is interested, is said to be bright.

Mt. Carmel, Ill.—The Mt. Carmel Development Company will establish a 4,000 horse power electric plant at Grand Rapids dam, two miles above here.

Moscow, Idaho.—The Moscow Electric Light & Power Company and the city council of Pullman, Wash., are considering the matter of having a heavy transmission wire stretched from Moscow to Pullman to furnish electric light for the latter place.

Automobiles.

Chicago, Ill.—Incorporation papers for the Chicago Automobile Transportation Company, with a projected capital of \$15,000,000, to install transportation lines throughout the city, employing 348 electric stages and 180 electric cabs, are being prepared. The capital has been subscribed largely by owners of Chicago office buildings and in the prominent stores.

Oswego, N. Y.—The Tonkin Steam Carriage Supply Company was organized here recently for the manufacture of boilers and appliances for automobiles, with a capital stock of \$50,000.

Syracuse, N. Y.—The National Frame & Metal Company, which was recently incorporated, has leased buildings in this city, and will commence at once the manufacture of automobile gears and bicycle frames. The company is capitalized at \$60,000, with John Dunn, Jr., president; John S. Kaufman, vice-president, and Charles A. Fox, secretary and treasurer.

Toronto, Ont.—The chief of police has lately been considering the subject of installing an electric patrol wagon.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by **ELECTRICITY** from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Authoriz'd	Issued.					Authoriz'd	Issued.				
Albany, N. Y.—Feb 18											
United Traction.....	100	\$5,000,000	\$5,000,000	1 1/2 % Q.	109	110	Hartford Conn.—Feb 18				
(Consolidation of the Albany and Troy City Railway.)							Hartford Street Ry. Co.....	100	\$4,000,000	\$200,000	8 % S. Oct.,
Allentown Pa.—Feb 18											
Allentown & Lehigh Val. Trac. Co	4,000,000	1,500,000			15		Hartford & West Hartford RR.....	100	1,000,000	247,000	8 % S. Oct.,
Bridgeport, Conn.—Feb 18:							Holyoke Mass.—Feb 18				
Bridgeport Traction Co.....	100	2,000,000	2,000,000	1 % Aug.	100		Holyoke Street Ry. Co.....	100	400,000	400,000	8 % A., June,
Baltimore Md.—Feb 18							Hoboken N. J.—Feb 18				
a United Railways & Elec. Co.....com.	50	24,000,000	13,000,000		18 1/2	18 1/2	North Hudson Co. (N. J.) Ry. Co..	25	1,250,000	1,000,000	8 %
Boston, Mass.—Feb 18							Indianapolis, Ind.—Feb 18				
New England Street Ry.....	25	5,000,000	1,081,925	1 % Q., Jan. 15,			* Indianapolis Street Ry.....		5,000,000	5,000,000	
North Shore Traction Co.....com.	100	4,000,000	4,000,000		15	16	Lancaster, Pa.—Feb 18				
North Shore Traction Co.....pfd.	100	2,000,000	2,000,000	5 % S. A. & O.	85	87	Pennsylvania Traction Co.....	100	10,000,000	9,900,000	
West End Street Ry. Co.....com.	50	10,000,000	4,080,000	8 1/2 % S. Oct., '99.	98	98 1/2	Lancaster & Col. Electric Ry.....			87,500	
West End Street Ry. Co.....8 % pfd.	50	4,000,000	6,400,000	4 % S. Jan.	112	113	West End Street Railway.....				
Boston Elevated R. R.....	100	10,000,000		2 1/2 % Aug. 99,	169	170	Louisville, Ky.—Feb 18				
Brooklyn N. Y.—Feb 18:							Louisville Ry.....com.	100	4,000,000	8,500,000	1 1/2 %
Brooklyn City Ry.....	100	2,000,000	1,928,400		235	240	Louisville Ry.....pfd.	100	2,500,000	2,500,000	2 1/2 % S. Oct. 1,
Brooklyn Rap. Transit Co., tr. cert.	100	48,000,000	48,000,000		74	76	Minneapolis, Minn.—Feb 18				
* Brooklyn Heights Railroad.....		200,000	200,000		107	109	Twin City Rapid Transit.....com.	100	17,000,000	15,010,000	
* Brooklyn City RR.....guar.	100	12,000,000	12,000,000	8 1/2 % Q., Jan.,	257	259	Twin City Rapid Transit.....7 % m.		8,000,000	1,712,200	1 1/2 % Oct.
* Brooklyn, Queens Co. & Sub. RR.	100	2,000,000	2,000,000				Montreal, Canada.—Feb 18				
Coney Island & Brooklyn RR.....	100	2,000,000	1,884,200	2 1/2 % Nov., 99	325	332	Montreal Street Ry. Co.....	50	4,000,000	4,000,000	8 % S. M. & N.
Kings County Elevated.....		4,750,000	4,750,000				Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1 1/2 % S. J. & J.
Kings County Traction Co.....	100	4,500,000	4,500,000	1 % July	75	80	Memphis Tenn.—Feb 18:				
Nassau Electric Railroad.....pfd.	50	6,000,000	6,000,000				Memphis Street Railway Co.....	100	500,000	500,000	
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000				New Haven, Conn.—Feb 18:				
* Brooklyn, B. & W. E. Railroad.....		1,000,000	1,000,000				Fair Haven & Westville RR.....	25	2,000,000	2,000,000	8 % S., Sept.
Buffalo N. Y.—Feb 18							New Haven Street Railway Co.....	100	1,250,000	1,000,000	2 1/2 % A., July
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000		74	75	New Haven & Centerville.....	100	700,000	800,000	
* Buffalo Railway Co.....	100	6,000,000	5,870,500	1 % Q. Dec., 99.	99	100	Winchester Avenue RR.....	25	1,000,000	600,000	
Columbus O.—Feb 18							New Orleans, La.—Feb 18				
Columbus Street Railroad.....	100	8,000,000	8,000,000	1 % Q., Feb.	35	39	Canal & Claiborne RR. Co.....	40	240,000	240,000	4 % S., July,
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000		92	93	New Orleans & Carrollton RR.....	100	1,200,000	1,200,000	1 1/2 % Q., Oct.
Charleston, S. C.—Feb 18							New Orleans Traction Co new com.	100			
Charleston City Ry. Co.....	50	100,000	100,000	8 % S.			* Crescent City RR.....guar.	100	2,000,000	2,000,000	8 % S., Jan.,
Enterprise City RR. Co.....	25	1,000,000	250,000				* New Or. City & Lake RR.....guar.	100	2,000,000	2,000,000	4 % S., Jan.,
Chicago, Ill.—Feb 18							Orleans Railroad.....	50	500,000	185,000	1 1/2 %
Chicago City Ry. Co.....	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99.	255	258	St. Charles Street Railway.....	50	1,000,000	1,000,000	1 1/2 % Oct.,
Chicago & South Side R. T. RR.....	100	10,323,800	10,323,800				New York—Feb 18				
Lake Street Elevated RR.....	100	10,000,000	10,000,000		9 1/2	10	Central Crostown RR.....	100	600,000	600,000	2 1/2 % Q.
Metropolitan West Side Elev. Ry....	100	15,000,000	7,000,000	Feb 28 1900.	25	28	* Christopher & 10th Sts. RR. guar.	100	650,000	650,000	2 1/2 % Q., Oct.
Met. West Side El., pfd.....	107 1/2	15,000,000	9,000,000		79	80 1/2	Dry Dock, E. B. Rdwy & Battery RR.	100	1,200,000	1,200,000	1 1/2 % Q., Nov.
North Chicago Street RR.....	100	10,000,000	6,000,000	8 % Q., Jan.	209	210	* Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000	2 1/2 % Q., Feb., 1900.
* North Chicago City RR.....	100	500,000	249,900		197	200	* Bleeker St. & Fulton Fy. Ry. guar.	100	900,000	900,000	1 1/2 % A., July,
South Chicago City Railway.....	100	2,000,000	1,608,200		99 1/2	100	* Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000	2 1/2 % Q.
West Chicago St. RR. Co.....	100	20,000,000	18,189,000	1 1/2 % Q., Feb.	99 1/2	100	* Gen. Park N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2 1/2 % Q.
Union Traction Ry.....com.		1,250,000	624,900	8 1/2 %	13 1/2	13 1/2	* Eighth Avenue RR.....	100	1,000,000	1,000,000	4 1/2 % Q.
Union Traction Co.....pref.	100	2,000,000	2,000,000	5 % S.	55	55 1/2	* 42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	4 1/2 % Q.
Cincinnati, Ohio.—Feb 18:							* Ninth Avenue RR.....guar.	100	800,000	800,000	
Cincinnati Inc. Plane Ry.....com.	50	1,000,000	575,000				* 18th Avenue RR.....guar.	100	2,000,000	2,000,000	
Cincinnati Inc. Plane Ry.....pfd.	50	150,000	150,000	1 % Feb.			* 20th St. R. R. Co. guar.	100	600,000	600,000	4 1/2 % Q.
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2 1/2 % Feb.	75	76	Second Avenue RR.....	100	2,500,000	1,862,000	2 % Q., Jan.,
* Cincinnati Street Ry. Co.....	100	18,000,000	14,000,000	1 1/2 % Q., Jan.	124 1/2	125	Third Avenue RR.....	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.
* Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1 1/2 % Q., Jan.	126 1/2	127	* 42d St. Manhattanville & St. Nich. Av	100	2,500,000	2,500,000	
Cleveland, Ohio.—Feb 18:							* Union (Husk)berry Ry.....	100	2,000,000	2,000,000	
Akron, Bed. & Cleve. Elec. Ry.....	100	1,000,000	1,000,000	3 % Jan.	48	50	Newark N. J.—Feb 18				
Cleveland City Ry.....	100	8,000,000	7,600,000	8 1/2 % Jan.	102	102 1/2	Consolidated Traction Co. of N. J..	100	15,000,000	15,000,000	
Cleveland Electric Ry.....	100	12,000,000	12,000,000	3 % Q., Oct., '99.	83	84 1/2	North Jersey Railway Co.....	100	6,000,000	6,000,000	
Detroit, Mich.—Feb 18:							United Elec. Co. of New Jersey..	100	504,000	504,000	1 1/2 % A.
Detroit Citizens' Street Ry.....	100	2,000,000	1,250,000		100 1/2		Pittsburg, Pa.—Feb 18				
Fl. Wayne & Belle Isle Ry.....	100	1,200,000	1,200,000		175		Allegheny Traction Co.....	50	500,000	1,000,000	
Rapid Railway Co.....	100	250,000	250,000		90	100	* Consolidated Traction Co.....com.	50	15,000,000	15,000,000	2 % Jan.
Windsor & Detroit River Ry.....	100	1,000,000	1,000,000		100		* Consolidated Traction Co.....pfd.	50	9,478,850		1 1/2 % Nov.
Dayton O.—Feb 18							* Central Traction Co.....	50	1,500,000		6 % A.
City Railway Co.....com.	100	1,500,000	1,470,600	1 1/2 % Q.	140	145	* Citizens' Traction Co.....	50	8,000,000		6 % A.
City Railway Co.....pfd.	100	800,000	600,000	1 1/2 % Q.	170		* Duquesne Traction Co.....	50	8,000,000		6 % A.
People's Street Railway.....		1,100,000	1,100,000		114	115	* Pittsburg Traction Co.....	50	2,500,000		8 1/2 % Nov.

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau Electric RR.

h \$20 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; \$250,000 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,100 of stock owned by West Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 5 % on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.

l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crostown Railroad at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavyon Ferry—now Metropolitan Street Ry.

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1895, at \$215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for \$145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1 1/2 % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Allegheny, Cent., Citizens', Duquesne, Fort Pitt & Pitt's Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on \$8,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Capital Stock.			Rate and Date of Last Div.	Bid.	Asked.	NAME.	Capital Stock.			Rate and Date of Last Div.	Bid.	Asked.
	Par	Authoriz'd	Issued.					Par	Authoriz'd	Issued.			
New Bedford Mass.—Feb 18							Boston, Mass.—Feb 18						
Union Street Railway Co.....	100	\$850,000	\$850,000	2% Feb.	160	165	American Tel. & Tel. Co.....	100	50,000,000	28,550,000	4% Q. Jan.	161	142
Northampton, Mass.—Feb 18							Erie Telegraph & Telephone Co.....						
Northampton Street Ry.....	100	800,000	225,000	4% A., June.	170	178	New England Telephone Co.....	100	10,394,600	10,304,600	\$1.50 p. sh. Feb	185	187
Omaha, Neb.—Feb 18							New York.—Feb 18:						
Omaha Street Ry.....	100	5,000,000	5,000,000	8% A. and N.	55	65	American Telegraph & Cable Co....	100	14,000,000	14,000,000	1% Q. Q.	91	94
Paterson, N. J.—Feb 18							*Central & South Am. Tel. Co.....						
Paterson R. Co.....	100	1,250,000	1,250,000	.....	54	—	*Commercial Cable Co.....	100	6,500,000	6,500,000	1% Q. Q.	100	105
Providence, R. I.—Feb 18:							Franklin Tel. Co..... 2% guar.						
United Traction & Electric Co.....	100	8,000,000	8,000,000	3% Q. Oct. '98	110	111	Erie Telegraph & Telephone Co.....	100	5,000,000	4,800,000	1% Q. Feb.,	116	118
Philadelphia.—Feb 18							*Gold & Stock Tel. Co. guar. 6%						
Fairmount Park Trans. Co. \$50 pd.	50	2,000,000	1,770,000	2% Dec. '98	28	24	*International Ocean Tel. Co. guar. 6%	100	5,000,000	.....	1% Q. Q.	116	118
Hestonville, Man. & Fairmount.....	50	1,966,100	1,966,100	2% Q. July 15, '99	47	48	Mexican Telephone Co.....	100	2,000,000	.....	2% Q. Q.	175	180
Hestonville, Man. & Fairmount 8% pf.	50	588,900	588,900	8% S. July, '99	75	76	*New York & New Jersey Tel. Co.	100	5,000,000	8,728,000	2% Q. Jan.,	70	75
Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	8% Feb. 1, '99	75	76	*Pacific & Atlantic Tel. guar. 4%	25	2,000,000	.....	2% S.	70	75
Union Traction Co. \$12 1/2 pd.	50	80,000,000	29,980,450	.....	82 1/2	84	*Postal Telegraph Cable Co.....	100	15,000,000	15,000,000	1% Q. Q.	95	100
Electric Traction Co.....	50	.....	8,297,920	.....	84 1/2	85	*Sout'n & Atlantic Tel. Co. guar. 5%	25	950,000	559,525	2% S.	115	118
*Citizens' Passenger Ry.....	50	500,000	192,500	\$3 share Q.	450	451	*Commercial Union Telegraph Co....	25	500,000	500,000	8% S. Jan., '99.	115	118
*Frankford & Southwark Pass. R.	50	.....	1,875,000	\$14 share A—Apr. '99	48	90 1/2	*Div. guar. by Postal Tel. Co.	—	—	97,970,000	1% Q. Jan. '99.	88	88 1/2
Lehigh Avenue Ry. Co.....	50	1,000,000	.....	.....	48	90 1/2	Miscellaneous.—Feb 18						
Lombard & South Streets Ry.....	25	.....	1,000,000	A. & O.	48	90 1/2	American Dist. Tel. (Phila.).....	25	400,000	.....	1% Q.	26	27
Second & Third Streets Ry.....	50	1,060,000	771,076	\$9 share A, Mar. '98	800	—	Bell Tel. Co. (of Canada).....	100	8,960,000	8,561,000	2% S.	188	—
People's Traction Co.....	50	10,000,000	6,000,000	8% A., April, '98.	150	151	Chesapeake & Potomac Tel. Co....	100	.....	.....	.....	67	70
Germantown Passenger Ry.....	50	1,500,000	572,800	\$5.25 share—1898.	150	151	Chicago Telephone Co.....	100	.....	.....	.....	200	210
Green & Coates Passenger Ry.....	50	500,000	150,000	3% Jan., 1898.	151	152	Central Dist. Ptg. & Tel. Co. (Pgh.)	100	750,000	750,000	.....	148	150
People's Passenger Ry.....	25	1,500,000	740,000	.....	—	—	Empire & Bay States Telegraph Co.	100	2,000,000	2,000,000	1% Q. Q.	75	76
People's Passenger Ry.....	50	750,000	277,402	.....	—	—	Hudson River Telephone Co.....	100	2,000,000	2,000,000	1% Q. Q.	120	124
Philadelphia Traction Co.....	50	30,000,000	120,000,000	\$2 p. sh. Oct. '98.	100	100 1/2	*Northwestern Telegraph Co. guar.	50	2,500,000	2,500,000	2% Q. Q.	122	125
Catherine & Bainbridge St.....	50	.....	400,000	6% A—Mar. '98.	158	157	Providence (R. I.) Tel. Co.....	50	.....	.....	.....	56	59
Continental Pass. Ry. guar.	50	1,000,000	580,000	\$6 share—July, '98.	158	157	Southern New Eng. Tel. Co.....	100	8,000,000	.....	.....	—	—
Empire Passenger Ry. Co.....	50	600,000	600,000	.....	—	—	ELECTRIC LIGHT AND ELECTRICAL MFG. COS.						
Philadelphia City Pass. Ry.....	50	1,000,000	475,000	\$7.50 share July '98	208	208 1/2	Boston, Mass.—Feb 18						
Philadelphia & Gray's Ry. RR.	50	1,000,000	298,650	\$3.50 share July '98	100	—	Fort Wayne Electric trust receipts..	25	.....	.....	.....	115	125
Ridge Avenue Passenger Ry.....	50	750,000	420,000	\$12 share July '98	309	309	Fl. Wayne Elec. Co. T. Sec. Series A.	100	40,000,000	80,460,000	2% Q. Aug., 1898.	18	25
Philadelphia & Dart, Ry. guar.	50	.....	200,000	\$2 share July '98	—	—	*General Electric Co. [old] com.	100	18,276,000	18,276,000	1% Q. Apr., 1900	208 1/2	208 1/2
17th & 19th Sts. Pass. Ry. guar.	50	.....	250,000	1% S. July, '98	—	—	General Electric Co. [new] com.	100	40,000,000	80,460,000	2% Q. Aug., 1898.	208 1/2	208 1/2
Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	885,000	\$11 sh. A., July, '98	300	—	T. H. Elec. Co. T. Secur., Series C.	50	.....	146,700	.....	55 1/2	55 1/2
Union Passenger Ry. Co.....	50	1,500,000	900,000	\$9.50 sh. July '98	249	240	Westinghouse Elec. & Mfg. Co. com.	50	.....	146,700	.....	69 1/2	70
West Philadelphia Pass. Ry.....	50	750,000	750,000	\$10 share, July '98	262	268	Westinghouse El. & Mfg. Co. pf.	50	4,000,000	8,996,058	1% Q. Jan.,	69 1/2	70
Rochester, N. Y.—Feb 18							Westinghouse El. & Mfg. Co. assent.						
Rochester Railway Co.....	100	5,000,000	5,000,000	.....	20	23	Edison Elec. Ill'g Co., New York..	100	9,183,000	7,988,000	.....	119	120
Reading, Pa.—Feb 18							*Edison Elec. Ill'g Co., Brooklyn..						
Reading Traction Co.....	50	1,000,000	1,000,000	Semi-an. Jan. & Jy	24	26	Edison Ore Milling Co.....	100	4,000,000	3,000,000	1% Q. Oct., '98.	8	12
City Passenger Ry.....	50	850,000	850,000	Jan., '98.	153	—	Electric Vehicle Co.....	100	.....	.....	.....	—	—
Reading Electric Ry.....	50	1,000,000	1,000,000	Jan., '98.	70	—	*General Electric Co. [old] com.	100	40,000,000	80,460,000	2% Q. Aug., 1898.	208 1/2	208 1/2
St. Louis Mo.—Feb 18							General Electric Co. [new] com.						
North Street & Arsenal Ry.....	50	800,000	150,000	.....	—	—	Interior Conduit & Insulation Co...	100	1,000,000	1,000,000	.....	41	—
Jennerson Avenue Ry. Co.....	50	400,000	400,000	2% Dec., 1888.	—	—	*Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Lindell Ry.....	100	2,500,000	2,400,000	1% Jan., '99.	—	—	Pittsburg, Pa.—Feb 18						
National Railway Co.....	100	2,500,000	2,479,000	1% Jan., '99.	—	—	Allegheny County Light Co.....	100	500,000	500,000	J. & J.	168	172
Cass Avenue & Fair Grounds.....	100	2,500,000	2,500,000	.....	—	—	East End Electric Light Co.....	50	800,000	800,000	Q	—	—
Union Pass. Ry.....	100	2,000,000	1,500,000	4% Oct., '98.	—	—	Philadelphia, Pa.—Feb 18						
St. Louis RR.....	100	2,000,000	2,000,000	2% Jan., '99.	—	—	Edison Electric Light Co.....	100	2,000,000	.....	.....	144	144 1/2
Missouri RR.....	50	2,400,000	2,800,000	1% Jan., '99.	25 1/2	25 1/2	*Electric Storage Battery Co. com.	100	8,500,000	.....	.....	70	75
People's RR. Co.....	50	1,000,000	800,000	50c. Dec., '89.	78	79	*Electric Storage Battery Co. pf.	100	5,000,000	.....	.....	70	75
United Electric Ry.....	50	500,000	500,000	.....	64	65	Northern Elec. Light & Power Co...	10	550,000	550,000	.....	18	18 1/2
United Electric Ry.....	100	1,000,000	1,000,000	3% Jan., '99.	68	70	Southern Elec. Light & Power Co...	10	187,500	187,500	.....	80	—
St. Louis & Suburban Ry.....	100	2,500,000	2,500,000	.....	—	—	Miscellaneous.—Feb 18						
Union Depot RR.....	100	4,000,000	4,000,000	3% A., July, '99.	—	—	Bridgeport (Conn.) Elec. Lt. Co....	25	500,000	.....	.....	47	48
San Francisco, Cal.—Jan							Missouri-Edison (St. Louis) com.						
California St. Cable RR.....	100	1,000,000	600,000	50c. monthly.	117	119	Eddy Electric Mfg. Co.....	25	.....	.....	.....	20	21
Geary Street Park & Ocean RR.....	100	1,000,000	875,000	\$2.50 share, '96.	61 1/2	68 1/2	Hartford (Conn.) Elec. Light Co....	100	850,000	.....	.....	175	176
Market Street Ry.....	100	18,750,000	18,750,000	Q. 60c. per share.	61 1/2	68 1/2	Hartford (Conn.) Lt. & Power Co....	25	175,000	.....	.....	6	10
Presidio & Ferries RR.....	100	1,000,000	550,000	.....	16	—	New Haven (Conn.) Elec. Lt. Co....	100	100,000	.....	.....	195	—
Seranton Pa.—Feb 18							Narragansett (Prov. R. I.) Elec. Co.						
Seranton Railway Co.....	50	6,000,000	2,500,000	.....	29	30	Rhode Island Elec. Protec. Co.....	100	.....	.....	.....	108	109
Seranton & Carbondale Trac. Co..	100	500,000	500,000	.....	16 1/2	—	Royal Elec. Co. (Montreal).....	100	1,000,000	.....	4% Q.	118 1/2	120 1/2
Seranton & Pittston Traction Co..	100	1,050,000	1,050,000	.....	—	—	Toronto (Canada) Elec. Light Co...	100	1,085,000	1,085,000	1% Q. Q.	183	185 1/2
Springfield Ill.—Feb 18							Thomson-Houston Welding Co.....						
Springfield Consolidated Ry.....	100	750,000	750,000	.....	—	—	Woonsocket (R. I.) Electric Co.....	100	.....	.....	8% S. Dec. 1,	105	106
Springfield O.—Feb 18							ALLIED INDUSTRIES.						
Springfield Street Ry.....	100	1,000,000	1,000,000	.....	—	11	Boston Mass.—Feb 18						
Springfield, Mass.—Feb 18:							American Electric Heating Co.....						
Springfield Street Ry.....	100	1,200,000	1,166,700	5% A.	207	212	Street Ry. & Ill'g Properties... pf.	100	4,500,000	1,248,700	\$2 p. sh.	—	—
Toronto Canada.—Feb 18							United Electric Securities Co... pf.						
Toronto Street Ry.....	100	6,000,000	6,000,000	1% S.	108 1/2	108 1/2	New York.—Feb 18:						
Montreal Street Railway Co.....	100	4,000,000	4,000,000	4% S.	272 1/2	265	Consolidated Electric Storage Co...	100	.....	.....	.....	8	12
Washington, D. C.—Feb 18:							Safety Car Heating & Lighting Co...						
Belt Ry. Co.....	50	500,000	500,000	.....	102 1/2	102 1/2	Worthington Pump Co.....	100	5,500,000	5,500,000	.....	160	165
Capital Traction Co.....	100	12,000,000	12,0										

ELECTRICITY.
BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

NAME.		Amount.		Due	Interest periods.	Bid.	Asked.	NAME.		Amount.		Due	Interest periods.	Bid.	Asked.
		Authorized.	Issued.					Authorized.	Issued.						
Albany N. Y.															
Date of Quotation—Feb 18, 1901															
The Albany Ry. Co.....Cons. mtg. 5s.	\$500,000	427,500	1940	J. & J.	117½	.....	.....	Canal & Claiborne RR.....cons mtg. 6s.	\$150,000	\$150,000	1912	M. & N.	.....	.....	
The Albany Ry. Co.....Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	116½	.....	.....	Crescent City RR.....1st mtg. 6s.	.....	80,000	1899	M. & N.	105½	.....	
Watervliet Turnpike & RR. 1st mtg. 6s.	850,000	850,000	1919	M. & N.	112	.....	.....	Crescent City RR.....Cons. mtg. g. 5s.	5,000,000	8,000,000	1948	J. & J.	.....	.....	
Watervliet Turnpike & RR. 2d mtg. 6s.	150,000	150,000	1919	M. & N.	112	.....	.....	New Orleans City RR.....1st mtg. 6s.	416,500	899,000	1908	J. & J.	108	112	
Troy City Railway Co.....1st 5s.	.....	.....	1942	.....	114	116½	.....	N. Orl's City & Lake RR. 1st mtg. g. 5s.	5,000,000	2,599,500	1948	J. & J.	119	118	
Interest guar. by Albany Ry. Co. (Principal and interest guar. by Albany Ry. Co.)															
Baltimore Md.															
Date of Quotation—Feb 18, 1901															
United Electric Ry. Co.....1st mtg. g. 4s.	88,000,000	18,000,000	1949	M. & S.	102	108½	.....	Atlantic Ave. (Brooklyn).....Imp. g. 5s.	1,500,000	1,500,000	1904	J. & J.	95	.....	
.....income 4s.	14,000,000	.....	1949	J. & D.	74½	75	.....	Atlantic Av. (Brooklyn).....1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110	
Baltimore City Pass. Ry. 1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118½	.....	.....	Atlantic Av. (Brooklyn).....Cons. mtg. 5s.	8,000,000	1,966,000	1901	A. & O.	115	116	
Baltimore Traction Co.....1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120	.....	Broadway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1948	J. & D.	128	128	
Baltimore Trac. Co. Exten. & Imp. g. 5s.	1,250,000	1,250,000	1901	M. & S.	104½	.....	.....	Broadway & 7th Ave. 1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	104½	
Bal. Trac. Co. No. Balto. div. 1st mtg. g. 5s.	1,750,000	1,750,000	1942	J. & D.	121	121½	.....	Broadway & 7th Ave. 2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110	
Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	.....	1900	J. & J.	101	.....	.....	Broadway Surface.....1st mtg. 5s.	1,125,000	1,125,000	1924	.....	115	117	
Baltimore Traction Co. Convertible 5s.	800,000	.....	1906	N. & M.	102½	.....	.....	Broadway Surface.....2d mtg. 5s.	1,000,000	1,000,000	1905	.....	105	106	
Central Pass. Ry. Co.....1st mtg. 6s.	96,000	117,000	1912	J. & J.	.....	.....	.....	Brooklyn City RR. Co. 1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117	
Central Pass. Ry. Co. Cons. mtg. g. 5s.	604,000	580,000	1902	M. & N.	119	121	.....	Brooklyn City & Newtown.....1st mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	115	116	
City & Suburban Ry.....1st mtg. g. 5s.	8,000,000	8,000,000	1922	J. & D.	116	117	.....	Brooklyn Bath & W. E. RR. Gen. mtg. 5s.	1,000,000	448,000	1903	J. & J.	101	.....	
Lake Roland Elev.....1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	.....	.....	Brooklyn Heights RR.....1st mtg. 5s.	250,000	250,000	1941	A. & O.	104	.....	
All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.															
Boston Mass.															
Date of Quotation—Feb 18, 1901.															
Lynn & Boston RR.....1st mtg. g. 5s.	5,879,000	5,702,000	1924	J. & D.	114	115	.....	Brooklyn, Q's Co. & Sub'n. 1st mtg. 5s.	8,500,000	8,500,000	1941	J. & J.	112	.....	
West End Street Ry.....Deben. g. 5s.	8,000,000	8,000,000	1902	M. & N.	104½	106	.....	Brooklyn, Q's Co. & Sub'n. 1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	.....	
West End Street Ry.....Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	.....	.....	Brooklyn Rapid Transit.....gold 5s.	700,000	5,181,000	1945	.....	109½	100½	
†\$1,674,000 in escrow to retire outstanding bonds of absorbed companies.															
Charleston S. C.															
Date of Quotation—Feb 18, 1901.															
Enterprise Street RR.....1st mtg. 5s.	500,000	47,000	1906	J. & J.	.....	.....	.....	Cent. Pk. N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109	
Charleston City Ry.....1st mtg. 6s.	850,000	.....	.....	J. & J.	106	.....	.....	Central Orestown RR.....1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	.....	
†Controlled by Charleston St. Ry. Co.															
Chicago Ill.															
Date of Quotation—Feb 18, 1901.															
Chicago City Ry.....1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101½	25	.....	Coney Island & Brooklyn RR. 1st mtg. 5s.	800,000	800,000	1908	J. & J.	101	108	
Chicago Passenger Ry.....1st mtg. 6s.	400,000	400,000	1908	F. & A.	.....	102	.....	Dry Dock, E. B'd'y & B't'y R. gen. mtg. g. 5s.	1,000,000	980,000	1902	J. & D.	117	120	
Chicago Passenger Ry.....Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	.....	.....	.....	Eight Ave. RR. Co. Cert. Indeb. 6½	100,000	1,100,000	1914	F. & A.	102	105	
Chicago & So. Side R. T. 1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	.....	.....	.....	42d St. Man. & St. Nich. Av. 1st mtg. 6s.	1,200,000	1,200,000	1910	M. & S.	116½	117	
Chicago & So. Side R. T. 4½s.	1,500,000	750,000	1907	J. & J.	.....	.....	.....	42d St. Man. & St. Nich. Av. 2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	.....	
Chicago West Div. Ry.....1st mtg. 4½s.	4,040,000	4,040,000	1902	J. & J.	108½	109	.....	Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1908	M. & S.	124	125	
Lake Street Elevated RR. 1st mtg. g. 5s.	7,574,000	8,781,200	1928	J. & J.	.....	.....	.....	Metropolitan St. Ry. Co. g. m. cl. tr. g. 5s.	12,500,000	19,500,000	1907	F. & A.	130	.....	
Metrop. W. Side Elev. Ry. 1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	98	98½	.....	Second Avenue Ry. Gen. cons. mtg. 5s.	1,600,000	1,600,000	1909	M. & N.	120	121	
North Chicago St. RR.....1st mtg. 5s.	8,171,000	8,171,000	1906	J. & J.	106	.....	.....	Second Avenue Ry. (L. I.) 1st mtg. g. 5s.	800,000	800,000	1909	J. & J.	118½	109	
North Chicago St. RR. Cert. Indeb. 6s.	500,000	500,000	1911	J. & J.	.....	.....	.....	Steinway Ry. (L. I.) 1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117	
North Chicago City Ry.....1st mtg. 6s.	500,000	500,000	1900	J. & J.	.....	.....	.....	Third Avenue RR. Co. 1st mtg. 5s.	850,000	850,000	1919	.....	110½	112½	
North Chicago City Ry. consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	.....	.....	Twenty-third Street Ry. 1st mtg. g. 5s.	5,000,000	5,000,000	1907	J. & J.	128½	.....	
West Chicago St. RR.....1st mtg. 4½s.	4,100,000	8,969,000	1928	M. & N.	111	.....	.....	Twenty-third Street Ry. 1st mtg. 6s.	.....	.....	1909	J. & J.	.....	.....	
West Chicago St. RR. Deben. 6s.	2,700,000	700,000	1911	J. & D.	101	102	.....	Union (Huckleberry) Ry.....Deb. 5s.	150,000	150,000	1906	J. & J.	106	108	
West Chicago St. RR. Cons. mtg. g. 5s.	12,500,000	6,000,000	1906	.....	106½	107	.....	Westchester Electric RR.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A.	118	116	
W. Chicago St. RR. Tunnel. 1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	.....	.....	.....	†\$1,085,000 in escrow to retire gen. mtg. bonds.	500,000	500,000	1948	J. & J.	110	114	
†Redeemable at option on 60 da. notice.															
†Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.															
†Subject to call after Oct. 1, 1899, at \$110 and interest.															
†Assumed by W. Chi. RR. Co., lessee.															
†Int. guar. by W. Chicago St. RR. Co.															
Cincinnati, O.															
Date of Quotation—Feb 18, 1901.															
Oh. New & Cov. St. Ry. 1st Cons. mtg. g. 5s.	8,000,000	2,800,000	1922	J. & J.	114½	115	.....	Montreal St. Ry.....1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	.....	.....	
†Mt. Adams & Eden Pk In. 1st mtg. 6s.	46,000	46,000	1900	A. & O.	108½	104	.....	†Toronto St. Ry.....1st mtg. g. 4½s.	4,650,000	2,200,000	1901	M. & S.	.....	.....	
†Mt. Adams & Eden Pk In. 1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	.....	.....	†\$85,000 per m. single track authorized.							
†Mt. Adams & Eden Pk Inc. Cons. mtg. 5s.	581,090	581,000	1906	M. & S.	108½	.....	.....	†\$600,000 in escrow to retire 6s due in 1901.							
So. Cov. & Cin. St. Ry. 1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½	.....	Philadelphia.							
So. Cov. & Cin. St. Ry. 2d mtg. 6s.	400,000	400,000	1902	J. & J.	182½	187	.....	Date of Quotation—Feb 18, 1901							
†Assumed by the Cincinnati St. Ry. Co.															
†\$250,000 reserved to retire 1st mtg. bds.															
Cleveland O.															
Date of Quotation—Feb 18, 1901.															
Brooklyn Street RR. Co. 1st mtg. 5s.	600,000	600,000	1908	M. & S.	106½	107	.....	Continental Pass. Ry.....1st mtg. 6s.	850,000	810,000	1909	J. & J.	.....	.....	
Cin. New & Cov. St. Ry. Cons. mtg. 5s.	8,000,000	2,500,000	1922	J. & J.	118½	114½	.....	Empire Pass. Ry.....1st mtg. 7s.	800,000	200,000	1900	J. & J.	.....	.....	
Cleveland City Cable Ry. 1st mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106	.....	Greene & Coates St. Ry. 1st mtg. 6s.	100,000	100,000	1898	J. & J.	.....	.....	
Cleveland Electric Ry. Co. 1st mtg. g. 5s.	8,500,000	1,249,000	1918	M. & S.	106	.....	.....	Lombard & So. St. Pass. Ry. 1st mtg. 6s.	150,000	.....	1901	.....	.....	.....	
Columbus (O.) Cent. Ry. 1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	.....	.....	.....	People's Pass. Ry.....1st mtg. 7s.	250,000	250,000	1905	J. & J.	.....	.....	
East Cleveland RR.....1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	.....	107½	.....	People's Pass. Ry.....2d mtg. 5s.	500,000	458,000	1911	J. & J.	.....	.....	
Fl. Wayne (Ind.) Elec. Ry. 1st mtg. g. 5s.	800,000	.....	1922	M. & N.	.....	.....	.....	People's Pass. Ry.....Cons. mtg. 6s.	1,125,000	807,000	1912	M. & S.	.....	.....	
Lorain (O.) Street Ry.....1st mtg. 6s.	200,000	200,000	1915	J. & J.	.....	.....	.....	People's Pass. Ry.....Stk. trs. cert. g. 4s.	5,698,210	.....	1948	.....	.....	.....	
St. Ry. Co., Grand Rapids.....1st mtg. 5s.	600,000	600,000	1912	J. & D.	.....	.....	.....	Phila. City Passenger Ry.....1st mtg. 5s.	200,000	200,000	1910	J. & J.	.....	.....	
†\$1,900,000 in escrow to retire bonds of absorbed companies, marked a.															
Interest guar. by Cons. St. Ry. Co.															
Detroit, Mich.															
Date of Quotation—Feb 18, 1901															
Detroit Citizens' St. Ry.....1st mtg. 5s.	7,000,000	8,885,000	1906	A. & O.	.....	102½	.....	Philadelphia Trac. Co. Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	.....	.....	
Fl. Wayne & Belle Isle Ry.....1st mtg. 6s.	400,000	877,000	1902	A. & O.	.....	106½	.....	Thirteenth & 15th St. Ry.....1st mtg. 7s.	100,000	100,000	1908	A. & O.	.....	.....	
The Detroit Ry.....1st mtg. 6s.	1,500,000	1,800,000	1925	J. & D.	105	.....	.....	Union Passenger Ry.....1st mtg. 5s.	500,000	500,000	1911	A. & O.	.....	.....	
†\$1,150,000 in escrow to retire bonds of St. City Ry. and Grand River St. Ry.															
New Haven Conn.															
Date of Quotation—Feb 18, 1901.															
New Haven St. Ry.....1st mtg. g. 5s.	600,000	600,000	1918	M & S	111	.....	.....	West End Passenger Ry.....1st mtg. 7s.	.....	.....	1905	.....	.....	.....	
New Haven (Bridgewood Div.) 1st mtg. 5s.	360,000	250,000	1914	J & D	111	.....	.....	West Phila. Pass. Ry.....1st mtg. g. 5s.	250,000	246,000	1906	A. & O.	.....	.....	
Manchester Avenue RR.....1st mtg. g. 5s.	100,000	800,000	1912	M & N	109	.....	.....	West Phila. Pass. Ry.....2d mtg. 5s.	750,000	750,000	1926	M. & N.	.....	.....	
Manchester Avenue RR.....Deben. g. 5	100,000	24,000	1919	M & S	.....	.....	.....	Pittsburg Pa.							
Date of Quotation—Feb 18, 1901															
Baden & St. Louis RR.....1st mtg. 5s.	250,000	250,000	1918	J & J	102½	103½	.....	Birmingham, Knox & Allentown.....5s.	500,000	500,000	1981	M. & S.	111½	.....	
Cass Ave. & Fair Gds Ry.....1st mtg. 5s.	1,212,000	1,212,000	1912	J & J	101½	102½	.....	Central Traction Co.....1st mtg. 5s.	875,000	875,000	1980	J. & J.	.....	.....	
Citizens' Railway Co.....1st mtg. 5s.	2,000,000	1,600,000	1907	J & J	101	.....	.....	Citizens' Traction Co.....1st mtg. 5s.	1,250,000	1,25					

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	B d.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—Feb 18, 1901						
Jefferson Avenue Ry.....1st mtg. 6s.	400,000	400,000	1906	M. & N.	108	106
Lindell Ry. Co.....1st mtg. 6s.	1,500,000	1,500,000	1911	F. & A.	108	109
Missouri RR. Co.....1st mtg. 6s.	1,000,000	700,000	1916	M. & S.	105	106
Mound City RR. Co.....1st mtg. 6s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co.....1st mtg. 6s.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 7s.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric.....1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 6s.	2,000,000	2,000,000	1900	M. & N.	99%	100%
St. Louis & Sub. Ry.....1st mtg. g. 6s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5s.	800,000	800,000	.....	.....	80	84
Southern Electric Ry.....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
Taylor Avenue St. Ry.....1st mtg. g. 6s.	500,000	500,000	1918	J. & J.	116	118
Union Depot RR. Co.....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100%
Union Depot RR. Co.....Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122
Controlled by St. Louis RR. Co.						
Controlled by Union Depot RR. Co.						
Controlled by Lindell RR. Co.						
\$200,000 in escrow to retire 1st & 2d mtg.						
\$500,000 in escrow.						
\$200,000 in escrow to retire 1st mtg. de.						
San Francisco Cal						
Date of Quotation—Feb 18, 1901						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
California St. Cable RR.....2d mtg. 6s.	650,000	650,000	1914	M. & S.	.....	117
Gerry St., Park & Ocean RR.....1st mtg. 6s.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126%	.....
Metropolitan Ry. Co.....1st mtg. 6s.	200,000	.....	.....	.....	.....	.....
Omni-bus Cable Co.....1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126%	.....
Park & Cliff House RR.....1st mtg. 6s.	850,000	850,000	1912	J. & J.	105%	107
Park & Ocean RR.....1st mtg. 6s.	250,000	250,000	1914	J. & J.	115	.....
Powell St. Ry.....1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Utter St. Ry. Co.....1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	.....	.....
Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Feb 18, 1901						
Belt Ry. Co.....Cons. mtg. 6s.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 6s.	500,000	500,000	1914	A. & O.	182	.....
Eckington & Soldiers' Home.....1st mtg. 6s.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	.....	.....
\$50,000 in escrow to retire 1st mtg. bds.						
Miscellaneous.						
Date of Quotation—Feb 18, 1901						
Bridgeport Traction Co.....1st mtg. 6s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 6s.	5,000,000	8,548,000	1931	F. & A.	118	.....
Buffalo (N. Y.) Ry. Co.....1st cons. m. 6s.	4,000,000	8,000,000	1938	M. & N.	104	105
Croton St. Ry. (Buffalo).....1st mtg. 6s.	8,000,000	2,866,000	1932	M. & N.	112	118
Columbus (O.) St. Ry.....1st cons. g. 6s.	3,000,000	2,261,000	1932	J. & J.	115	.....
Consolidated Traction (N. J.).....1st mtg. 6s.	15,000,000	18,965,000	1938	J. & D.	111%	111%
Cross'n St. Ry. (Colo.).....1st mtg. g. 5s.	2,000,000	572,000	1938	J. & D.	115	115%
Denver City Cable Ry.....1st mtg. g. 6s.	4,000,000	8,800,000	1920	J. & J.	20	.....
Denver Con. Tram'y Co.....Cons. m. g. 5s.	4,000,000	922,000	1930	A. & O.	80	85
Louisville (Ky.) Ry.....1st cons. mtg. g. 6s.	6,000,000	4,981,000	1930	J. & J.	119	119%
Minneapolis St. Ry.....1st cons. mtg. g. 5s.	5,000,000	4,050,000	1919	J. & J.	110%	110%
No. Hudson Co. Ry. (N. J.).....Cons. mtg. 6s.	8,000,000	2,378,000	1928	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.).....2d mtg. 6s.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.).....Deb. 6s.	500,000	489,000	1902	F. & A.	.....	.....
Paterson (N. J.) Ry.....Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	.....	.....
Rochester (N. Y.) Ry.....1st mtg. 6s.	8,000,000	2,000,000	1930	A. & O.	.....	.....
St. Paul City Ry.....Cons. g. 5s.	5,500,000	4,298,000	1937	.....	105%	106
St. Paul City Ry.....Deb. g. 6s.	1,000,000	1,000,000	1900	.....	108	.....
\$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
\$500,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
\$750,000 in escrow to retire bonds of C. St. RR. Co.						
\$87,000 in treasury.						
\$960,000 reserved to redeem prior liens						
\$620,000 in escrow.						
						*With int'

*With int'res

ELECTRIC LIGHT AND ELECTRICAL MFG. COOS

Boston, Mass.						
Date of Quotation—Feb 18, 1901						
Delaware Gas L. Co.....1st m. 5s. g.	800,000	800,000	.....	J. & J.	108	108
Edison Elec. Illuminating Co., Boston	2,026,000	.....	.....	Quar.	107	.....
General Electric Co., gold coup. deb. 6s.	10,000,000	8,750,000	1923	.....	116	.....
Pittsburg Pa.						
Date of Quotation—Feb 18, 1901						
Allegheny County Light Co.....6s.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co., Scrip. 6s.	195,570	.....	.....	M. & S.	.....	.....
Miscellaneous.						
(Feb 18, 1901.)						
Edison El. Ilig. Co. (N. York) 1st m. 5s.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilig. Co. (N. Y.) con. m. g. 6s.	15,000,000	2,188,000	1908	.....	124	.....
Edison Elec. Ilig. Co. (Brooklyn).....	6,000,000	5,000,000	1940	.....	122%	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Po. Co. 1st mtg. 6s.	2,500,000	.....	1887	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 6s.	5,176,000	.....	1897	A. & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 6s.	8,000,000	.....	.....	F. & A.	102%	.....
United Elec. Light & Power Co. (N. Y.).....	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous						
Date of Quotation—Feb 18, 1901.						
American Bell Telephone.....4s.	.....	.....	1908	F. & A.	100%	101
Northwestern Telegraph Co.....7s.	.....	.....	.....	.....	114	115
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 5s.	.....	.....	1911	J. & D.	108	106
Chesapeake & Potomac Teleph. Co.....5s.	.....	.....	.....	.....	.....	.....

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—Feb 18, 1901						
American Electric Heating.....7s.	500,000	500,000	.....	.....	.....	.....
Armington & Sims Engine Co.....	.....	.....	.....	.....	.....	.....
Barnes & Smith Car Co.....6s.	.....	.....	1905	J. & J.	106	107
Corbitt & Mfg Co.....6s.	.....	.....	1904	J. & D.	.....	.....
Worthington Pump Co.....	75,000	.....	.....	.....	115	127
Valued						
Nominal						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16¼c.; Lake, 16½@17c.; casting, 16½@16¼c.

It is stated that negotiations are on for the nationalization of the telegraph systems of the Dominion of Canada.

The Mexican Telephone Company reports for December: Gross earnings, \$15,910; operating expenses, \$8,333; net earnings, \$7,577.

The Nassau Electric Railroad Company's \$10,474,000 consolidated mortgage guaranteed 4 per cent. gold bonds have been listed on the New York Stock Exchange.

The directors of the General Electric Company held their regular semi-monthly meeting on February 15. They gave out no statement and transacted only routine business.

A dispatch from St. Petersburg, Russia, states that an elevated railroad system for that city is being planned, to cost in all 190,000,000 roubles. It is hoped to enlist American capital.

The Kings County Electric Light & Power Company has declared the regular quarterly dividend of 1½ per cent., payable March 1. Books closed February 19 and reopen March 1.

The Electrical Commission of Baltimore, Md., has informed the telephone and telegraph companies of that city that they must have their wires underground by the end of the present year.

The Standard Light and Power Company of Montreal declared a dividend for the six months ending March 1 next at 8 per cent., per annum payable to stockholders of record of that date.

The members of the Rapid Transit Commission of New York City appeared before the Municipal Council on February 13, to urge approval of the plan for the proposed extension of the rapid transit to the Battery and thence to Brooklyn.

It is authoritatively stated that the dividend on the South Side Elevated Railroad Company of Chicago's stock will not be increased at the meeting to be held on February 28. Some time this year, however, the shares may be put on a 4 per cent. basis.

The United Railways & Electric Company of Baltimore reports for the year ended December 31, 1900: Gross earnings, \$4,431,743; increased, \$206,425. After paying operating expenses, fixed charges, dividend on the preferred stock, interest on income bonds, taxes, etc., there is a surplus of \$90,000. The retiring board of directors was re-elected on February 13.

The Third Avenue Railroad Company reports for the quarter ended December 31, 1900: Gross earnings, \$551,735; operating expenses, \$327,508; net earnings, \$224,227; other income, \$5,893; total income, \$230,120; fixed charges, \$440,824; deficit, \$210,704; deficit previous quarter, \$150,867. General balance sheet shows: Cash on hand, \$715,869, and profit and loss (deficiency) \$718,388.

Although the subsidiary companies of the Erie Telephone system have not made up their figures for 1900, it is understood that the estimates thus far made show gross earnings for 1900 of \$4,950,000, or an increase over the previous year of \$1,273,000. The net earnings are estimated at \$1,760,000, an increase over 1899 of \$487,000. The total number of telephone subscribers to this system was on December 31, 1900, 141,589. The net gain in subscribers as compared with the previous year was 35,041.

Advices from Boston state that the directors of the Edison Electric Illuminating Company and of the Boston Electric Light Company are again holding conferences with a view to consolidation. The proposed basis of consolidation is said to be somewhat similar to the original "Morgan" plan as to interest return of 11½ per cent. and 10 per cent. respectively to Edison and Boston Company, stockholders, but proposed amalgamation will be in the nature of a consolidation rather than a lease by a third company.

R. T. Wilson & Company, who held a controlling interest in the stock of the Detroit United Railway Company, which is a consolidation of the street railways of Detroit, have sold their holdings to a syndicate headed by Henry A. Everett, president of the Cleveland Electric Railway Company, and E. W. Moore, vice-president of the Western Reserve Trust Company of Cleveland, acting in connection with Kean, Van Cortlandt & Co. of this city. R. T. Wilson, M. Orme Wilson and James M. Edwards have retired from the board of directors and E. W. Moore, of Cleveland, Arthur Pack, of Pontiac, Mich., and R. B. Van Cortlandt have been elected in their places.

The Boston "News Bureau" states that the railroad commissioners have sent to the Massachusetts House of Representatives their answers to the questions asked by Representative Bullock of New Bedford regarding the Massachusetts Electric Companies. The commissioners state that the Massachusetts Electric Companies is a voluntary association of owners of shares of stock in electric light and steel railway corporations, and as such is not recognized by the board; but the companies in which the association owns shares issue no stock or bonds and effects no consolidation except under the supervision of the board and upon actual exhibit of corporate property and sworn statements of financial conditions.

At a meeting of the directors of the Edison Illuminating Company of Boston held on February 15, it was voted to issue new stock to an amount to be fixed by the Gas & Electric Light Commissioners, probably between 6,000 and 7,000 shares. A meeting of the stockholders will be called within two weeks to ratify the issue of new stock. President Edgar, of the Edison Company, states that the new stock is for the purpose of paying off floating indebtedness and also to refund a mortgage on the plant of the company and has nothing to do with any proposed combination with the Boston Electric Light Company. The present capital stock of the Edison Company is \$4,320,000 and the proposed increase will bring the total capitalization up to \$5,000,000.

ELECTRICITY.

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EDITORIAL NOTES.

"Electricity's" Educational Series.

It may interest our read-
ers to know that begin-
ning with article twenty
of *ELECTRICITY*'s Educa-
tional Series—which in-
cidentally has proven a great success—Mr.
Eaton will take up the subject of telephony.
These articles should prove invaluable to
workers in the telephone field and will no
doubt elicit as much favorable comment as
those now running. It is the author's inten-
tion to treat the subject in a thorough manner.
The working of the most up-to-date common
battery systems will be explained, and when-
ever necessary the articles will be illustrated.

* * *

The Education of an Electrical Engineer.

In view of the great
amount of attention that
is being given in this coun-
try to the subject of the
training of electrical en-
gineers and workers, a paper
read on the 12th inst. before the Manchester
section of the Institution of Electrical Engi-
neers of England should prove interesting.
The author was Mr. John T. Nicolson and the
subject was entitled "On the Training of Elec-
trical Engineers." After referring to the mat-
ter in a general way Mr. Nicolson states that
electrical engineering is a more exact science
than other branches of engineering, as practice
has been largely directed by a consummate
theory, whereas in other departments theory
has, at its best, only endeavored to understand
and explain practice.

Mr. Nicolson strongly advocates the use of a
laboratory in connection with every first-class
school of applied science. He says: "The
fundamental principles of thermodynamics
may not be of much use in helping a man to
fix the size of the cylinders of a steam engine,
but they will at all events keep him from wast-
ing his time in trying to design a perpetual-
motion machine; and they will show him how
far he can hope to go in the direction of the
improvement of his heat motors, or other
energy transformers.

"But the province of the laboratory in the
scheme of engineering education is—first, to
extend scientific knowledge by providing more
experimental data, and second, to show to the
student the scope, value and limitations of the
theories he has studied in the class room."

Mr. Nicolson gives it as his opinion that
after leaving school a boy should, before enter-
ing college, spend two years in the workshop
of a mechanical engineer. He says:

"I would point out, however, that the work-
shop course here proposed, is merely the prelim-
inary or first part of the student's professional
training. If he has left school with the usual
stereotyped stock of Euclid, algebra and ele-
mentary physics and chemistry, I would have
him take mathematics, physics and chemistry
classes in the evening, but more especially
mathematics, during these two years of work-
shop practice."

Mr. Nicolson then outlines what he consid-
ers an ideal engineering course as follows:

"Having then put in two years in a mechani-
cal engineering work shop, our ideal student
ought to enter an engineering college at about
the age of eighteen, and he ought to study
there for not less than three years.

"The first year of this college course will
usually have to be spent on mathematics,
physics, chemistry, dynamics; mechanical,
geometrical and freehand drawing, and the
study of French and German, which is so nec-
essary for enabling him to read foreign tech-
nical literature.

"In the second year the electrical engineer-
ing student must specialize in the physical lab-
oratory in the direction of electro-magnetic
theory. He must study the magnetic quali-
ties of iron, and the hysteresis loss, and in
doing so he must learn the construction of the
instruments such as the galvanometers, volt-
meters and ammeters he uses in his work, and
the methods of their calibration. All this ex-
perimental work should, of course, proceed
hand in hand with instruction in theory and
numerical exercises in the class room, where
he should be working at electromagnetism and
the theory of the direct-current dynamo.

"In this same year he must apply a consider-
able portion of his energy to the study of ther-
modynamics and hydraulics, and their applica-
tion to steam and water power plants, and he
should devote great attention to the study of
machine design and mechanical drawing. The
electric engineer must have a special knowl-
edge of applied electricity; but he must be
above all an engineer, and not a mere electrici-
an.

"In his final year, three-fifths of the stu-
dent's time should be spent in the laborato-
ries; one-fifth in the electrical engineering de-
signing room, and the other fifth upon lecture

courses connected with his laboratory work. About one-third of his laboratory time should be devoted to experiments on the strength of materials, on the simpler hydraulic phenomena, and to trials of steam engines and boilers. I think that at least thirty days of eight hours each should be spent in this way in his third year. Another third of the time spent in the laboratory in his last year would be occupied in completing the elementary electrical laboratory course he began in his second year. He would after completing his work on magnetic testing, begin a study of the dynamo. For this purpose the laboratory would probably be provided with a number of direct current dynamos of various types and styles of construction, of from 2 to 10 kilowatts capacity, which can be operated either as dynamos driven from a constant speed prime mover, or as electric motors."

The method of procedure for obtaining a thorough education in electrical engineering as outlined by Mr. Nicolson is an excellent one, but differs somewhat from what has been considered the ideal system in this country. As a rule a young man passes directly from school into college, where he gets a thorough theoretical training, and a certain amount of practical information by the use of the laboratory. He then, if in earnest, succeeds in being taken into one of the large manufacturing concerns, where for several years he works at a nominal salary in the shops, learning to apply the theoretical knowledge with which he is loaded. This *modus operandi* has been the means of turning out some of the brightest and best informed electrical engineers in the country.

* * *

An Italian Process for Smelting Ore.

The British Consul at Milan, Italy, recently reported on a method of electrical smelting which was tested in that country. The report states that the merit claimed for the process—known as Captain Hassano's—is one of economy. His experiments were begun in Rome, but have now for some time been carried on under his personal superintendence, by a company formed for the purpose at Darfo, in the Province of Brescia, where a considerable water power is available.

The preliminary operations would appear to be rather costly, as the ore has first to be reduced to powder and then to be mixed with a certain proportion of powdered coal or charcoal, which is necessary for the production of carbonic acid gas. As it would not be practicable to charge the furnaces with this powder, Captain Hassano adds to it, for binding purposes, a sufficient quantity (from 5 to 10 per cent. it is believed) of vegetable tar, and by subjecting the mixture to hydraulic pressure forms a cake, which is cut up into pieces of from 1½ inches to 2 inches square. These pieces are put into the furnace, and the smelting is brought about by intense heat, produced by a voltaic arc. At the end of last month, at Captain Hassano's request, a Commission, composed of five well-known scientific men, spent two days at Darfo, and witnessed a series of experiments. These gentlemen have now issued a very brief report to the effect that they consider the Hassano process to be industrially practical. The Consul states that he has consulted several very competent authorities at Milan, who have carefully followed the development of Captain Hassano's inven-

tion (one of them, in order to have greater facilities for doing so, became a shareholder in the company), and they are of the opinion that, as yet, no adequate proof has been furnished that the new system will not cost more, rather than less, than the one actually in use. Moreover, its application, with any prospect of success, appears to be dependent on the possession of a very abundant water power, at very low price, for the production of the electric energy, the consumption of which is enormous. With regard to the Commission, it has been pointed out that among its members there was no practical ironmaster, and that the report really only amounts to a declaration that ore can be smelted by electricity. All things considered, concludes the Consul, it would appear to be unadvisable to adopt Captain Hassano's process until the possession of the advantages claimed for it has been much more clearly demonstrated.

* * *

The Cables of the World.

Much of the important work of the past decade has been the result of combined capital, brain and muscle, and not one of the important combinations that have been consummated have outranked in importance and in far-reaching results that of the international cable. The entire cable network of the world in 1898 comprised 1,460 lines, with an estimated length of about 192,634 miles. Of this number of lines no less than 1,142, with a total length of 22,867½ miles, were under Government management, the remaining 319, with a combined length of 169,021 miles, were in the hands of private companies.

From the figures available it is shown that these cables are distributed as follows:

Australia and New Zealand have 31 cables under Government control, with a combined length of 397 miles, or .2 per cent. of the total.

British India has 111 Government cables, with a combined length of 2,206 miles, one independent company having 3 cables with a combined length of 168 miles, a total mileage of 2,374 miles, or 1.3 per cent. of the total.

British America has only one cable, which is under Government control and has a total length of 1,056 miles, or .5 per cent.

The Bahamas have one line under Government control, with a mileage of 245 miles.

The English-American Telegraph Company controls 15 cables with a total length of 14,130 miles, or 7.5 per cent. of the total.

Germany has 58 cables under Government control, whose total length amounts to 2,336 miles, in addition to which there is one private company controlling one cable, which is 1,280 miles in length, making a total length of 3,616 miles, or 1.8 per cent. of the total. This is a remarkably small allowance, when it is remembered that Germany's share of the commerce of the world is not less than 12 per cent.

The Government of Great Britain controls 135 cables with a total length of 2,287 miles; to this must be added 19 private companies operating 223 cables having a combined length of 110,609 miles; thus making a total number of 358 cables, and a combined length of 112,896 miles, or 59 per cent. of the total mileage. Thus it will be seen at a glance that Great Britain is consequently almost absolute mistress of the entire cable union, and the 6,000,000 telegrams which travel yearly over the cable route pass, for the most part, through her hands. She has 14 great ocean cables in

working order, 9 of which belong to her exclusively. Africa, America, and India are wrapped about in a network of English cables. One company, the English Eastern Extension, manages over 18,642 miles of cables in East Asiatic and Australian waters.

France has 54 Government cables of 5,788 miles; four private companies operating 28 cables with a total length of 13,602 miles, or a total number of 78 cables with a combined length of 19,390 miles, or ten and one-tenth per cent. of the whole. Under the direction of France beside the control of the Mediterranean Union, is the cable traffic in her West Indian and South American possessions.

The United States has four companies, all of which are private, and the total length of which is 21,131 miles, distributed between 22 cables, thus giving her 11.1 per cent. of the total mileage. The United States is interested in 5 of the cables of the trans-Atlantic Union; and Central America, as far as Peru, is under the almost exclusive control of American companies.

It is rather remarkable to note that while Russia has nine cables all of which are under Government control, the combined length only amounts to 264 miles. Enterprising little Japan has 70 cables to her credit, all under Government control, with a total mileage of 1,734 miles.

The North Danish Telegraph Company, a private concern, operates 24 cables with a length of 8,025 miles, or over 4 per cent. of the whole. Besides its cables on the Baltic Sea, this company manages, with the aid of Russia, the trans-Siberian underground telegraph to Vladivostock, and has extended it from that point to various parts in Eastern Asia. In East Asia are twelve cables, under Government control, with a combined length of 2,048 miles. Spain operates 15 cables, 1,084 miles; Italy, 29, 1,221 miles; all of which are under Government control.

In addition to the foregoing 438 cables are operated by the Netherlands, Belgium, Norway, Sweden, Denmark, and the Northeast sea states, whose combined length only amounts to 839 miles. In other countries, are 178 Government cables, with a length of 2,184 miles, and 2 private companies, operating a like number of cables, with a total of 178 miles.

It is estimated that the total value of this cable network is \$1,190,000,000. It might be well to pause and think, before preaching against combined capital, how very little of this would have been possible without the combination, in fact, whether any of it would have ever materialized.

THE sum of \$2,300 is to be expended by the Inaugural Committee for the illumination of the Court of Honor on the nights of March 3, 4 and 5, in connection with the second inauguration of William McKinley. Wreathing columns of white smoke, issuing from the pyre urns which surmount the immense pylons, will be illumined by electric searchlights, which will cast their shafts of varying colored radiance high into the heavens. Incandescent lights, from 2,500 to 3,000 in number, of 8, 16, 32 and 100 candle power, will illumine the pillars of the 80 foot pylons, the colonnade of thirty-two columns and the four reviewing stands to be erected within the Court of Honor. Within the top of each of the eight pylons will be concealed a searchlight of 10,000 candle power. The rays from these lights will

be cast directly upward. The searchlights will be operated by a man who will be stationed in the top of each pylon. From the pyre urns which surmount the pylons will issue white smoke. The smoke will be made from excelsior and muriatic acid, and transmitted through the urns by means of pipes. The varicolored rays from the searchlights thrown through an opening in the base of the pyre urns will play upon the smoke, producing a scene of most varying and fantastic splendor.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

THE Twenty-fourth Convention of the National Electric Light Association will be held at Niagara Falls, N. Y., May 21, 22 and 23, 1901. Headquarters will be at the International Hotel.

THE Central Railroad of London, Eng., better known as the Tuppenny Tube, has decided to try American motors instead of the heavy electrical engines now employed, and has ordered from an American company three small motors mounted on bogie trucks under the carriages.

THE steamship *Georgic*, which arrived in New York on February 20 from Liverpool, had on board K. W. Shorman, who had charge of the experiments with wireless telegraphy on the steamer *Georgic* off Brow Head. Mr. Shorman said that he sent messages to Brow Head from a distance of over thirteen miles and received replies, but could not receive messages further than that, owing to the fact that the rolling of the ship somewhat disarranged his instruments. He used a system invented by Colonel Henry Montague Hozier, secretary of Lloyd's London, and Nevil Maskelyne, of the Egyptian Hall, Piccadilly, London. The instrument on the vessel was attached to the metal of the ship and connected with wires which were attached to fore and aft stays of the steamer.

A MARVELOUS system of State canals, the boats to be run by electricity and to be 100 feet long by 25 feet wide, with a draught of 10 feet, and to travel in fleets going from Albany to Buffalo, N. Y., in less than three days, is the plan presented by State Engineer Bond and a capable board of engineers to Gov. Odell. The system is to be built for \$7,000,000 less than proposed by the Canal Commission appointed by ex-Gov. Roosevelt. The canals will be able to carry 15,000,000 tons of freight in a season of seven months.

THE important system of direct telephone and telegraph connections between Norway, Sweden, Denmark, and Germany, which has been in course of construction for some years, has just been completed, says the London "Electrician." The work on the direct telegraph system commenced in November, 1898, when the laying of the cable began between Trelleborg, the southernmost point of Sweden, and a spot near Sassnitz, in the Island of Rügen, on the Pomeranian coast, which has now been finished. The cable is 112 km. in length, with four wires, and it has now been directly connected with Stockholm, via Malmö, on the Sound, by a new 3 mm. copper wire. Through these new cables, direct com-

munications have thus been established between Stockholm and Berlin, Stockholm and Hamburg, Gothenburg and Hamburg, Malmö and Berlin, Malmö and Stettin, and Malmö and Emden. The telephone connections between Denmark, Sweden, and Norway have also been established by the laying of a cable, 20 km. long, across the Sound from Vidbek, on the Danish, to a point near Landskrona, on the Swedish coast. Moreover, through double cables of 4.5 mm. thickness each between Christiania, Gothenburg, Malmö, Copenhagen and Malmö and Stockholm, the central and south of Sweden has been placed in direct telephone connection with the two neighboring States. The Swedish and Danish capitals will shortly be in direct telephonic connection with the north of Sweden and Lapland, whose iron mines are proving a veritable Golconda. A line of 4.5 mm. copper wire is now being laid to the north. This line will in time be continued along the new Trans-Scandinavian railway, now under construction, to its terminus, Ofoten Fjord, on the North Atlantic shore. In the above-mentioned cables, having a total length of about 2,000 km., there have been used about 400 tons of bare copper wire, and the cost has been kept within the estimated grants. To Sweden it is a matter of interest and importance that whereas copper wire had formerly to be bought abroad, all the quantity used in this case has been manufactured at home, much other material being also of Swedish make.

A MEETING of the Executive Committee of the Canadian Electrical Association took place at Montreal on the 12th inst., at which arrangements were made for the annual convention to be held at Ottawa. It was decided that the dates of the convention should be the 19th, 20th and 21st of June next. A strong local committee was nominated to arrange for "papers and topics for discussion," and also to make the necessary arrangements for the meeting, which gives promise of being a most successful one.

FOR the month of January the expenditure on the subway of the Rapid Transit System in this city, exceeded \$600,000, and about \$2,500,000 has now been paid out for this great enterprise.

THE Brooklyn Rapid Transit Company in order to secure good service will establish a school of instruction for motormen. It will be located at the 58th street depot. Each man will receive two weeks' instruction. Applicants for positions as motormen or conductors will have to take a "school car" out and operate it under the supervision of a skilled employe. Tracks for the operation of skeleton cars, with dummy motor boxes and brakes will be laid. The men will be taught the details of operation, the application of the electric current and its results in reversal.

IN view of the fact that the United States Post Office Department is making every effort to increase the efficiency of the rural free delivery service, it is probable that electric railways extending into outlying suburbs or running through sparsely settled farming communities will be called upon to assist in the rapid and frequent delivery of mail matter. It is interesting to note that the earliest successful experiment in the collection and

delivery of mail matter by trolley cars was that made about ten years ago in St. Louis, Mo., by Major John B. Harlow, at present United States Civil Service Commissioner at Washington, D. C., who was then postmaster at St. Louis. The idea of collecting and distributing mail matter by means of especially equipped trolley cars running to the outlying parts of the city occurred to him, and was soon put in practice, and its immediate success was the cause of the adoption of similar plans in many other cities. As may be readily understood a considerable part of mail matter collected by trolley mail cars never passes through the general post office, as it is sorted, cancelled and distributed along the route by the clerks, who form the working crew of the car. In this manner the often limited capacity of a general post office is greatly relieved.

THE Grand Canyon of the Colorado in North-eastern Arizona was visited last season by hundreds of tourists, and in order to handle the anticipated increase this year a scheme of establishing an automobile line from Flagstaff, Ariz., to the Grand Canyon is being entertained by local capitalists. S. E. Farcte, who conceived the idea, has gone to Chicago to make arrangements.

THERE has recently been installed at Liverpool, Nova Scotia, an electric marine railway of a novel character. The equipment of this railway consists of a 30 horse power induction motor, the motor being geared to a heavy worm shaft and wheel, the worm wheel shaft carrying a pinion wheel which gears into another large wheel, on the shaft of which is placed a large, heavy sprocket wheel; over this sprocket wheel the heavy two-inch chain meshes into heavy sprocket teeth. This chain hauls the vessel upon a cradle over a track projecting out into the River Mersey to a distance of 500 feet, on a grade of $\frac{1}{4}$ inch to the foot. The track and cradle are built of heavy pine timbers. It formerly took from four to five hours to haul up a vessel, by the motive power hitherto supplied by horses, whereas the same work is now performed by electricity in 20 minutes. The present railway is the first one in America and probably the first one of its kind in the world operated electrically.

GEORGE T. EYANSON, a young electrician of Philadelphia, Pa., is credited with the invention of a new electric battery, economical and easily applicable to traction and lighting. The invention is covered by between thirty and forty patents. Application for patents has also been made in Great Britain, Canada, Germany, France, Austria and Belgium. Eyanson has worked in secret on his invention for seven years, and now that it is completed heavily capitalized companies have been formed to support the invention. Automobiles, according to the plans of the organizers, will first be fitted with the Eyanson system. After that lighting will be taken up. There is said to be no leakage of energy from the new battery, and that a system of recovery has been perfected by which the power producing properties of the battery are brought back to their original state at trivial cost, and with the great advantage of being chemically pure. The Eyanson battery, it is claimed, can be built into a vehicle, and requires only fresh solution from time to time. It is added that it is far less limited in its radius than the ordinary storage battery.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 16.

ARC LIGHTING.

Early in the nineteenth century Sir Humphrey Davy, an English scientist, gave the first demonstration of the electric arc, and the high degree of illumination which could be secured by it. At that time the dynamo was unknown and the means for producing the current was by the use of primary batteries, as the fact that electrical action could be produced by chemical means was already known. It is understood that this scientist made use of several thousand cells of primary batteries in the demonstration. The terminals of the circuit he connected to two pieces of charcoal, and then by slightly separating the two pieces secured an arc of light of dazzling brilliancy, such as probably had never before been produced artificially. This discovery created a great deal of interest at the time, but not until the introduction of the dynamo, quite a number of years later, was this experiment put to any practical use, and then was started the development which has resulted in the perfect system and application of arc lighting as we have it to-day.

If the two terminals of a battery or dynamo, of sufficient electrical pressure, be connected to two pointed pieces of carbon, and current allowed to flow over the circuit by placing the points of the carbons together in electrical contact, the tendency of the current will be to heat the carbons where they join on account of the resistance offered at this point to its flow. If the carbons be then slightly separated, the current will continue to arc or flow across the intervening space, and the energy expended by the current in overcoming this resistance creates heat, which causes the two points of the carbons to come to a very brilliant white heat. The heat of the electric arc is so intense that the granules of carbon become vaporized, and this vapor existing in the space between the carbons creates a better path for the current than air alone, and consequently the current continues to flow.

When two carbon pencils are united by an electric arc the points of the carbons gradually waste away and the pencils become shorter. On account of this it is necessary to provide an automatic feeding device which will operate in such a manner as to keep the space between the carbons uniform and also to separate the carbons, called drawing the arc, when the current is first applied. The styles of mechanisms and manner of operation for accomplishing this are as varied as the manufacturers, although most all direct current arc lamps involve the same principle in their operation. This principle generally provides for an inductive wound coil placed in series with the lamps, which performs the part of drawing the arc by operating magnetically on an armature which is mechanically attached to the rod that holds the top carbon; also another coil of much higher resistance than the former, connected in shunt with the carbons, that is, across the arc. The magnetic condi-

tion of this coil will depend entirely on the distance between the carbons, or in other words, the resistance of the arc. This coil is so arranged that when the magnetic condition increases a certain amount, it releases a feeding mechanism which allows the top carbon to feed downward. The mechanism may be arranged for adjustment in such a way that the magnetic strength of the shunt coil will act against a spring or it may be made to act against the magnetism of the series coil.

It would be out of the question to attempt a description of the mechanisms involved in accomplishing a uniform feed by this principle as there are so many; however in most cases they can be easily understood upon examination.

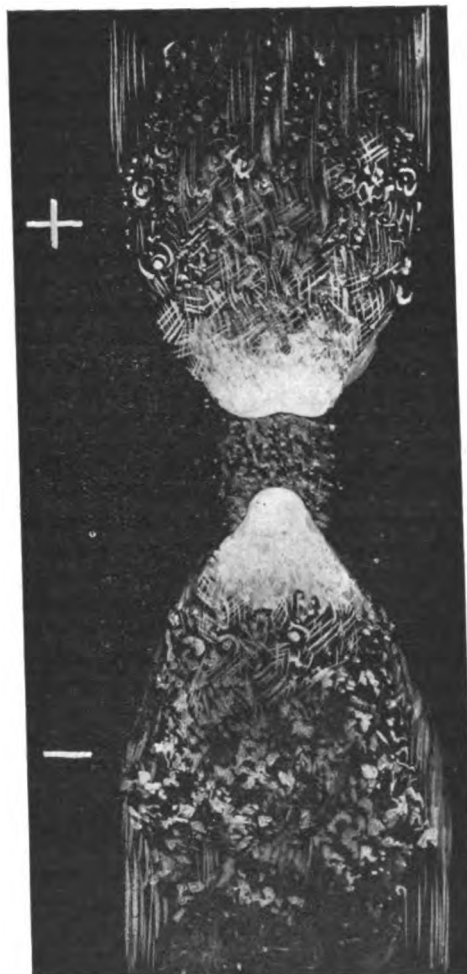


FIG. 1.

The construction of an arc lamp does not require so much inventive capacity as ingenuity and good mechanical knowledge, and the improvements that have been made consist more in the simplification of the feeding and regulating arrangement than in any alteration of principle.

As a result of being exposed to air, the carbons gradually burn away, the positive pencil being consumed with twice the rapidity of the negative, since its particles are being continually carried away and deposited on the latter, many being partially consumed in the process. In this manner the extremity of the negative carbon becomes slightly pointed, and a crater-like hole forms in the end of the positive. The appearance of the points of the carbons, after the current had been applied for some time, would look very much like that shown in Fig. 1, if observed through smoked or colored glass.

I might state here that it is very injurious to the sight to examine an arc closely with the

naked eye, and would suggest that when this has to be done some medium be used to look through, such as smoked glass.

When carbons are too close together a sort of hissing sound will be given out by the action of the current. When the arc is too long the carbons will flame at the points. The proper burning distance is when the carbons are operating in such a position that the arc will neither flame nor hiss. Flaming of an arc may also be caused by impurities in a carbon, so consequently it does not always indicate that the arc is drawn too long.

The rate in which carbons are wasted away when a lamp is in operation depends on the size and quality of the carbon and also on the amount of current flowing. Lamps that are constructed for all night use usually have a double set of carbons, so that when one set is entirely wasted away by use the controlling mechanism automatically shunts the circuit to the other set.

Arc lamps usually operate at a pressure ranging from 45 to 50 volts and it is given as a standard, and generally accepted, that an arc having a flow of $9\frac{1}{2}$ amperes has an illuminating capacity of 2,000 cp. and one using $6\frac{1}{2}$ amperes as 1,200 cp., whereas a lamp using only 4 amperes is said to have a brilliancy of 600 cp. This is used as a standard rating and generally accepted although it is a question whether the actual candle power given out under those conditions reaches anywhere near these figures.

On a direct current lamp the positive carbon is the hottest and has the greater illuminating incandescent surface when in action; consequently as a result of this and of the crater shape it assumes, the greatest amount of light is given out at about 45 degrees downward. For this reason the best illuminating effect in street lighting can be secured when the lamp is suspended about the center of the street and 25 or 30 feet from the pavement.

It is easily discernible whether a lamp is burning "up side down" or not by noticing the direction of the most brilliant rays. This can be more readily seen in interior illumination than in outside lamps.

As a general rule arc lamps are connected in series so that the same current passes through each lamp in a circuit. This is made possible by the use of a series wound dynamo so regulated as to keep the magnitude of the current uniform. This is very important in the proper regulation of the lamps.

One advantage in the use of series arc lighting is the saving of copper in construction as a great many lamps may be operated on one circuit and the carrying capacity does not have to be any greater for 100 lamps than for one.

Multiple arc lamps are constructed to be operated from incandescent circuits and they are divided into two classes. Those adapted for use on direct current and those adapted for use on alternating current. It has only been within the last few years that alternating lamps have arrived at such a degree of perfection as to in any way rival the direct current lamp.

The alternating current arc does not effect or burn the carbons, just as described in Fig. 1, but both points become slightly hollowed or crater shaped.

Focusing arc lamps are usually constructed in such a manner that the feeding mechanism operates both the upper and lower carbons and in such a way that the arc will be maintained in one particular position. These styles of

lamps are commonly used for searchlights and in theatrical effects. Usually a special quality of carbon is used and often considerably larger in size than the ordinary ones. Sometimes as high as 20 or even 30 amperes of current is used in lamps of this description. In several cases where focusing lamps are used as searchlights they have been made to operate at as high as 20 amperes. The largest searchlight at the World's Fair in Chicago used 160 amperes.

POINTS FOR REVIEW OF PREVIOUS ARTICLES.

What is the effect of self induction on alternating currents?

Why is there no flow of current in the neutral wire of a three wire system when both sides are balanced?

On what principle do electrical measuring instruments rely for their operation?

What is meant by eddy currents and what causes them? How are they prevented?

What is meant by the frequency of an alternating current?

Why does reversing the current on the brushes of a motor reverse the direction of its rotation?

Why does there practically no current flow through the primary of a transformer when the secondary is not closed?

Article No. 17 will be entitled "Incandescent Lighting."

A TUNING SYSTEM FOR WIRELESS TELEGRAPHY.*

BY ANDERS BULL.

The tuning of wireless telegraphic apparatus is a question that has so often been discussed in the columns of this journal, that most readers probably are acquainted with its importance. This article will describe a system by which a solution of the problem can be arrived at. The system was invented by the writer of this article one and one-half years ago, and details were given at the meeting of the Electrotechnischer Verein, Berlin, on December 18 last. By this system the possibility of messages being intercepted by stations for which they were not intended will be almost precluded, and independent signaling may be carried out between a considerable number of stations lying within the sphere of influence of each other's waves, while several dispatches can be transmitted simultaneously without their being affected the one by the other.

For this purpose the signals are conveyed from the transmitters to their corresponding receivers exclusively by the aid of series of impulses, each series consisting of a certain number of short wave impulses following each other at predetermined intervals of time. By suitable choice of these intervals the impulses can be arranged in series of different form. Now it is possible to tune each transmitting and receiving pair for its own special form of series in such a way that the transmitter only dispatches series of this special form, and the corresponding receiver only responds to series of the same form.

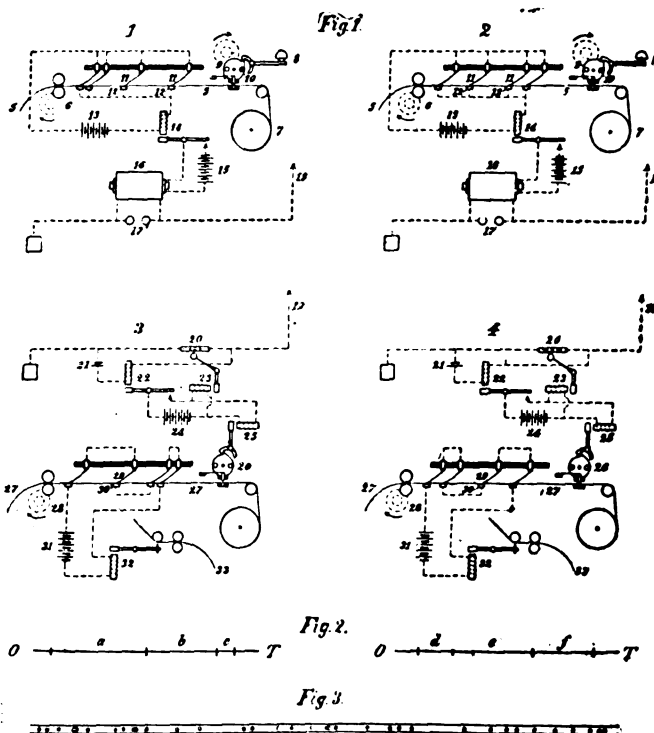
Fig. 1 in the diagram shows two transmitters, 1 and 2, with their two receivers, 3 and 4, arranged according to this principle. Suppose the left-hand one of these sets to be tuned for the series *a, b, c*, the one on the right for the series *d, e, f*, as shown in Fig. 2, where the time-intervals are represented by lengths on

the axis OT, and the impulses by cross strokes.

The transmitter consists of a paper tape 5, which, by means of clock-work 6, is drawn from the reel 7 at as even a rate as possible. The tape first passes through a perforating device, forming a hole in it by each depression of the key 8. The punching of the holes is performed so rapidly that the movement of the tape is not interfered with; a ratchet wheel 9 is released and makes half a revolution, by which one of the two projections 10 strikes against the punch attached to a spring. In a line with the punch, a number of contact brushes 11, supported by metal pieces, 12, are arranged, adjustable for various distances apart, and they press lightly against the tape 5. The brushes 11 are electrically connected together, as well as their supporting pieces 12. While the tape is moving, every hole must pass the brushes, which are generally insulated from their supporting pieces 12 by the paper, and metallic contact will momentarily be effected

sent from the cell 21 excites the relay 22. This then closes by attracting its armature, a secondary circuit, containing the battery 24, a decohering device 23, and the electro-magnet 25. The latter releases in like manner, as described above, a punching device 26, and a hole is formed in the tape 27. The hammer at the same time knocks upon the coherer, the resistance of which is again increased, and the relay 22 and magnet 25 release their armatures. The receiver is then ready to respond to another impulse, and, consequently, each arriving impulse is indicated by a hole in the tape 27.

In the receiver the same number of brushes as in the transmitter are arranged in a line with the punch. The points of contact between these and the metal pieces 30 are, however, not connected in parallel like those of the transmitter, but in series, so that a current from the battery 31 can only first flow through the writer 32, when all the brushes



between each brush and its support through the hole, causing the current from the battery 13 to excite the relay 14, the armature of which is attracted. Thereby connection is established between another battery 15 and the primary of an induction coil 16. Then a discharge takes place between the spark balls 17, connected in the usual manner with the earth and the mast wire 18, a wave impulse being caused to emanate from the latter.

The hole must pass all the brushes, and by passing each a new impulse is produced. As the tape is moving at an approximately constant speed, the intervals occurring between such impulses must, consequently, correspond with the distances between the brushes 11. At each depression of the key 8 a hole is formed in the tape, and, as a matter of course, a special series of impulses is sent out by the transmitter. By various adjustments of the brushes 11 the form of this series can be altered to any desired extent.

At the receiving station the waves impinge upon the mast wire 19, which is connected to the coherer 20. At each arriving impulse the resistance of the latter is reduced, and the cur-

are simultaneously in contact with their supports—i.e., when there is one hole under each brush. As the tape 27 at the receiver is unwound by means of clockwork 28, at an approximately constant speed, the distances between the holes made by the punch when impulses encounter the mast wire 19 will correspond to the intervals of time at which the impulses arrive. The greater these intervals are, the greater will be the spaces between the holes.

A series of a certain form will always, therefore, produce a group of holes at distances apart, corresponding to the intervals between the impulses. If, then, the brushes of a receiver are arranged at the same distances apart as the holes in such a group—i.e., in such a manner that, at a certain position of the tape, each hole in the group is covered by a brush—a simultaneous contact of all the brushes can only be effected by series of a similar form as that transmitted. The current from the battery 31 will then, so long as the simultaneous contact lasts, flow through all the points of contact and the writer 32, the lever of which will be attracted, and a dot be printed on the tape 33.

*From the "Electrician," London.

Each corresponding set of apparatus can thus be adjusted for its own special form of series. If several transmitters are working simultaneously, all their impulses on each receiver within their sphere of influence will be indicated by holes in the tape 27, and the latter will assume an appearance somewhat similar to Fig. 3. A receiver will, however, only respond to those of the punched holes that have the same mutual spacing as its brushes. The filled-in holes in Fig. 3 may thus represent groups by which the left-hand receiver in Fig. 1 will be put into action.

It might appear as if groups of this kind could also be formed accidentally by holes produced by impulses intended for other receivers, but this may easily be prevented. For this purpose the various series must be formed in such a way that the time-intervals between any two impulses in them are all different. If, by making the intervals short, the space of time between the successive series of each transmitter is always sufficiently great in relation to the length of the series themselves, then in no instance can the groups of holes produced by one of the transmitters contribute more than one hole to the formation of one group of holes of another kind. In order, therefore, that any critical group of, say, four holes could be formed accidentally, the number of the simultaneously-worked transmitters would also have to be at least four. If, in consequence, their number is but three, accidents of the kind described are precluded.

For the purpose of making this plain I shall call the special series of four transmitters respectively: *a, b, c*; *d, e, f*; *g, h, i*; and *k, l, m*. The series should then be chosen in such a manner that none of the following 24 time-intervals are alike.

<i>a, b, c,</i>	<i>d, e, f,</i>
<i>a + b b + c,</i>	<i>d + e, e + f</i>
<i>a + b + c</i>	<i>d + e + f</i>
<i>g, h, i,</i>	<i>k, l, m,</i>
<i>g + h, h + i</i>	<i>k + l, l + m,</i>
<i>g + h + i,</i>	<i>k + l + m.</i>

As each of the above series consists of four impulses (three intervals), any three of the four mentioned transmitters can be worked simultaneously without the possibility of an accident happening. Some series that, for instance, would satisfy requirements are: 9, 4, 15; 2, 6, 12; 11, 5, 17; and 3, 7, 14; where the intervals are expressed in suitable units of time. It will easily be seen, that, no matter how one places two of the corresponding groups of holes above each other, these will never have more than one hole in common.

According to what has already been stated, the number of the transmitters, worked simultaneously, should not exceed the number of time-intervals in the series employed. Only by providing the apparatus with more brushes, the number of transmitters could be increased. It might, however, appear in practice, that this number could confidently be greater than according to the above condition; in any case that would depend greatly on the careful and exact manufacture of the apparatus.

It must be noticed that a synchronism between the clockworks 6 and 28, by which the paper tapes in the transmitter and receiver are unwound, is not necessary, as long as the relation between the speed of the tape and the spacing of the brushes is alike in both apparatus. The more perfectly this is attained the smaller can be the size of the holes in relation to a certain rate of the tape 27, and the

less will be the chance of critical groups being formed when the number of the transmitters exceeds the number of the intervals in the series.

As shown above, for each depression of the key 8 of a transmitter, a dot will be printed on the tape 33 of the corresponding receiver. If, then, the Morse code be employed, two dots, closely following each other, might represent a dash. It would be better, however, in this case to furnish the apparatus with two independent systems of brushes—i.e., to tune each corresponding set for two special forms of series, and use the one for dashes and the other for dots. The transmitter would then be provided with two keys, and the receiver with two writers, one of which would mark the dashes, the other the dots on one and the same tape 33.

The system is especially suitable for the type-printing apparatus of Hughes. As each

itself. The apparatus are entirely independent of each other. Any station is, therefore, capable of sending several different messages as well as of receiving some and sending others at the same time.

My system can also be adapted in telegraphing by wire. In this case the relay 14 at the transmitting station might send current impulses from the battery 15 direct into the line, this being at the receiving station connected to the magnet 25. Especially by employing the Hughes apparatus, I consider my system practicable for wire telegraphy.

The apparatus can also be made in other and more practical forms, but as this article is only intended to explain the principle of the system this form has been chosen to illustrate it in a simple way. The apparatus can be made, for instance, by using an arrangement of a number of pendulums with a similar period of oscillation, so that the evenly-running devices neces-

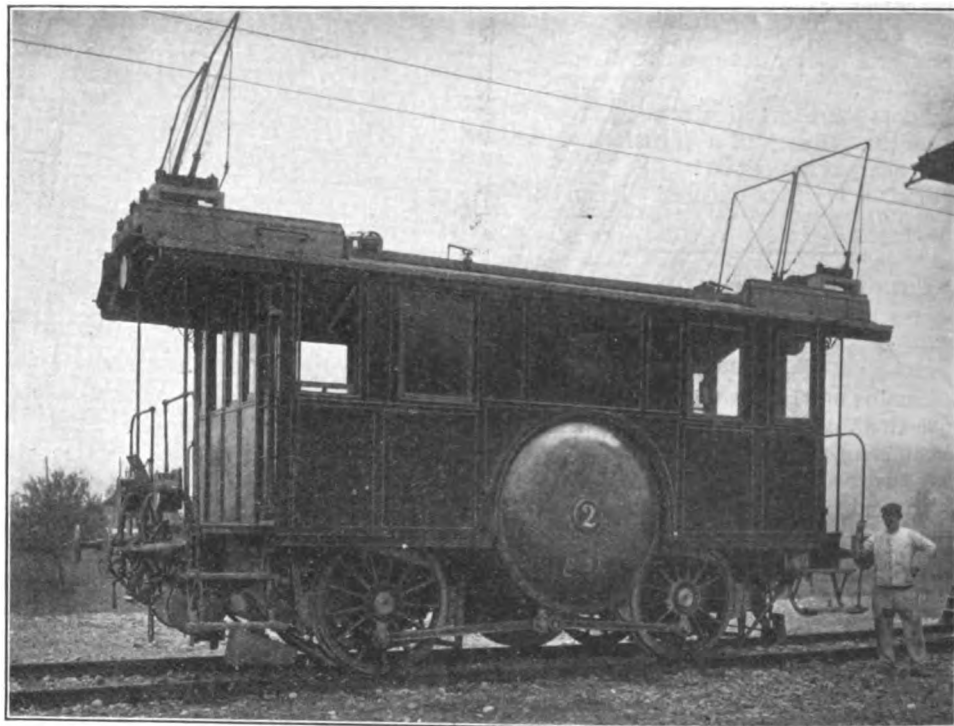


FIG. 1.—LOCOMOTIVE ON BURGDORF-THUN ELECTRIC RAILWAY.

letter requires in such apparatus only one short current impulse, it is only necessary to tune each corresponding set for one form of series. Each current impulse is transformed at the transmitting station into a series of wave impulses, which at the corresponding receiving station again is transformed in a single-current impulse. One great advantage that would be gained in using the Hughes apparatus is that the messages exchanged could be kept secret, for the transmission of the signs, by means of series, would render an illegal interception of the dispatches very difficult; such interception would be impossible when Hughes apparatus is employed.

Instead of, as in the above-described arrangement, allowing decohering to take place mechanically by a knock of the hammer, automatic coherers could be employed—for instance, those invented by Tommasina and by Neugschwender—as they would act with far greater precision and rapidity than others.

In my system it is immaterial where the various transmitters and receivers are placed, whether several apparatus are mounted at one and the same station, or whether each is by

sary for the apparatus above described could be dispensed with; this, of course, would greatly simplify the management of the apparatus, as they would only require winding like clocks from time to time, and no further attendance would be wanted.

II.—POLYPHASE ELECTRIC RAILWAYS IN EUROPE.

BY FRANK C. PERKINS.

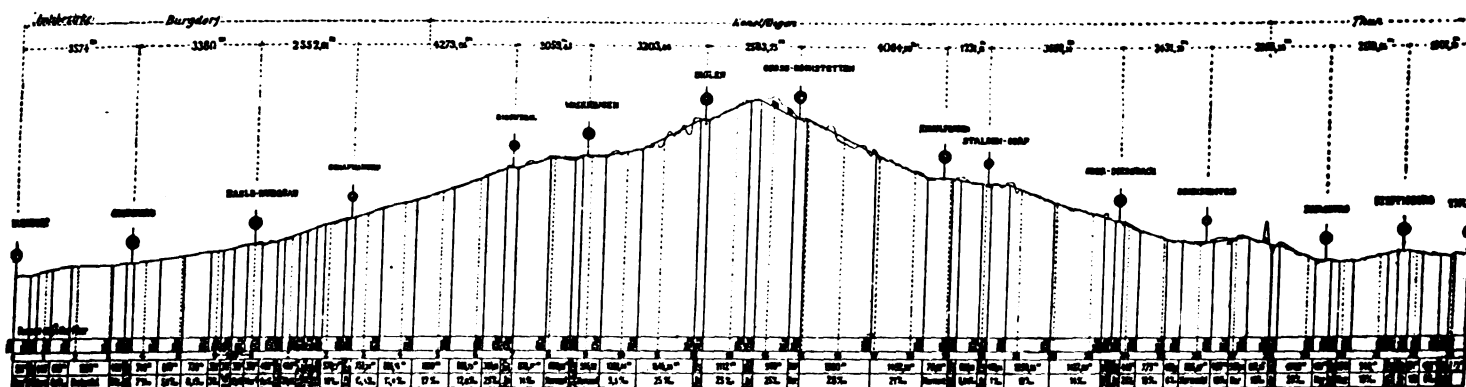
The Burgdorf-Thun Polyphase Railway.

This line is in Switzerland and joins together three of the main lines radiating from Berne. The line to Alten is met by this road at Burgdorf. The line to Lucerne is met by this railway at Konolfingen, and the line to Interlaken is met at Thun. The Burgdorf-Thun three-phase railway is a standard gauge polyphase road and is 40 kilometers long. The energy is derived from the Kander power house, where the current generated has the high potential of 16,000 volts. The contact or trolley line has a potential of 750 volts. There are two polyphase locomotives on this line of the type

shown in Fig 1, each of which is equipped with two 150 hp. three phase locomotives, of the type built by Brown, Boveri & Cie of Baden. This line is also equipped with six motor cars, each having four 60 horse power polyphase motors. It will be noted by the accompanying

are each connected with a rheostat placed under the car and each operated independently of the other. On starting the car the controller throws all of the resistances in with the motors, and the controller gradually throws out the resistances until the rotors are finally

tons. From the trolley lines two sliding contacts convey the current to the motors, the third connection being through the wheels of the locomotive. The rotors of the two motors on the locomotive are provided with rheostats and sliding contacts for purposes of control.



PROFILE OF BURGDORF-THUN POLYPHASE RAILWAY.

profile of the line that the grade from Burgdorf to Konolfingen, a distance of 16 miles, is very high, there being an up-grade the whole distance; while from Konolfingen to Thun there is a heavy down grade throughout the entire distance of nine miles. The whole line is operated by the polyphase system and there are on an average of 20 trains per day between Burgdorf and Thun. The power house on the Kander is close to Thun and is located at Spiez. The generators in the power house supply a 4,000 volt current, which is transformed to 16,000 volts by step-up transformers. The current is carried at this tension from the power house along three overhead copper wires, of 5 millimeters cross section, to the step-down transformers located at two-mile intervals along the line between Thun and Burgdorf. At these sub-stations the current is transformed down from 16,000 volts to 750 volts and conducted to the two hard drawn copper trolley wires which are each 8 millimeters in diameter, the rails forming the third conductor. The total capacity of the power house on the Kander is 3,600 horse power. Four turbines are used of a capacity of 900 horse power each. These turbines directly connected to four double current (single phase and three-phase) alternators are seen in the accompanying illustration, Fig. 2, of the interior of the generator room at Spiez.

The single phase current is used entirely for lighting and the three phase current for power transmission. The switchboard in the Kander power house is noted in Fig. 3. The generator room is 33 meters long and 11.5 meters wide, and provision is made for six turbines and generators. The motors used are of the eight-pole three-phase type and give 64 horse power when connected to a line of 750 volts potential and a frequency of 40 cycles per second. Four of these motors are used on each motor car, which has a total weight of 32 tons when equipped. The frame is about 50 feet long and six and one half feet wide, the wheel base being 7 ft. 2½ in. Each car has a seating capacity for 66 persons. The trailers are much lighter and only weigh about a third as much as the motor cars. The motor synchronism speed is 600 revolutions per minute, which would give the car a speed of nearly 36 feet per second or about 24 miles per hour. The four motors are connected in parallel and operated by two controllers, one at each end of the motor car. The four rotors

short circuited. The speed is kept nearly constant in spite of the heavy grades, only 2 per cent. change being noted on the grades from the normal speed of 39 kilometers per hour. By using the automatic tachygraph only the above small variation is noted from the high grade of 1 to 40 to the level, and the same remarkable effect on down grade is noticed, the speed only increasing 2 per cent. on a grade of 1 to 40.

For freight traffic on the Burgdorf polyphase

SHAFTINGS AND COUPLINGS.

"If half the attention which is being paid to figuring up the horse power of engines was given to looking out for shafting, the coal bills would be much smaller than they are now." This remark, made by one of the best known engineers of to-day, one, by the way, to whom the indicator is an open book and whose knowledge of "figuring horse power" makes many an engineer envious, rather set me to thinking.

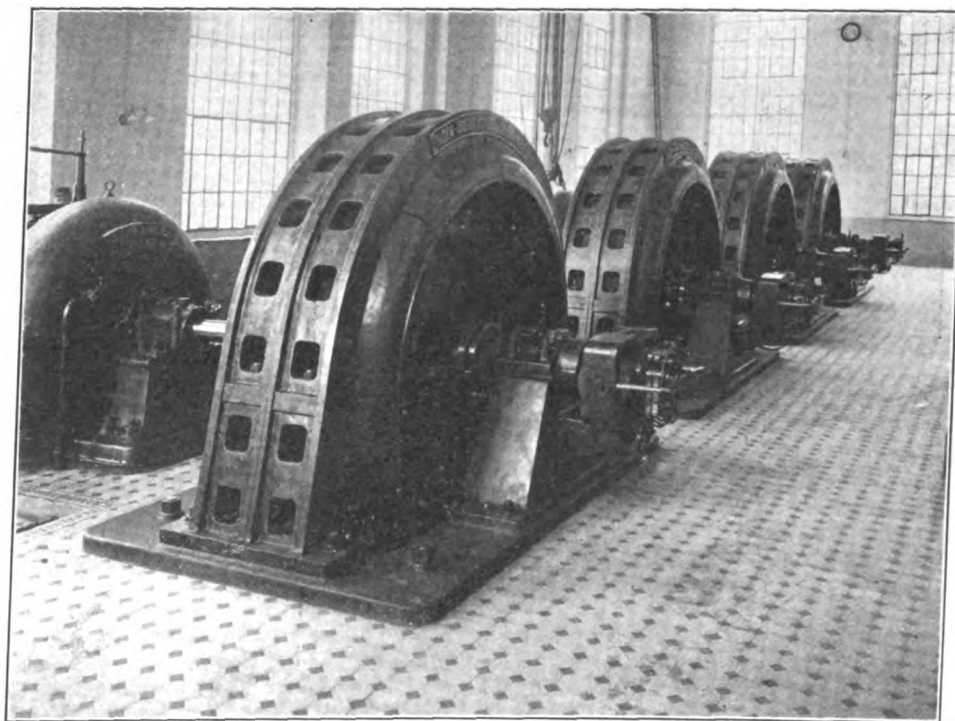


FIG. 2.—KANDER POWER HOUSE OF BURGDORF-THUN POLYPHASE RAILWAY.

road electric locomotives are used of the type shown in Fig. 1. They are specially designed for the purpose and were built by Brown, Boveri & Cie. They each have a capacity of 300 horse power and are capable of hauling a maximum train weight of 50 tons at full speed up the steepest grade of 1 to 40. The locomotive weighs 30 tons, thus leaving only 20 tons for the train, but by reducing the speed of the locomotive by gearing to half speed, this will allow it to draw 70 tons up the steepest grade of 1 to 40, the total train load then being 100

How many engineers to-day are sure that their hundreds of feet of shafting is in line? Very few. Now, this is all wrong. It should not be enough to know that the shafting is in line and level when it is first set up, but care should be taken to see that it keeps so. The constant strain of belts has a strong tendency to draw a shaft out of line, while the continual though apparently unperceptible settling of all buildings loaded with heavy machinery of course must throw it out of level; then, too, there is quite a difference in shrinkage in tim-

bers, and that will draw more or less upon the hangers, which has practically the same effect, so that our worthy brother engineer's remark is one that should set us all to thinking.

In the first place, are you using any more line shafting than is necessary? Now, you will all say no, as a certain engineer told me in reply to the question some years ago, when, as a matter of fact, his principal weaving mills were driving just twice the amount of line shaft that was actually necessary, for instead of making one line of shafting do for two floors by belting the second room up through the floor from shafting in the room below, they had run their main lines for each floor separate.

Now I do not claim that it took twice as much power to drive that shafting as it would had it been set up the other way, but it required considerable more.

My reader may say, "Well, the man who put it up must have been unwise," but an expert

if he happens to have a slight dislike for the belt man, the leather worker is sure to be to blame for any ous the shafting may show. If the machinist happens to be in disfavor it is laid to his door, and not infrequently the engineer, who may be less at fault than any of the others, comes in for his share of the censure.

An amusing but somewhat aggravating case came under my notice a few years ago when a large plant was compelled to shut down on account of the breaking of four out of seven of the bolts in one of the main shaft couplings, the heads of which were all broken close to the shank.

"Mr.—, how do you shut down your engines?" asked the man in charge.

"Why, the same as I always have," came the answer.

"Well, after this I want you to shut them down slower; you'll break every shaft in the mill if you keep on."

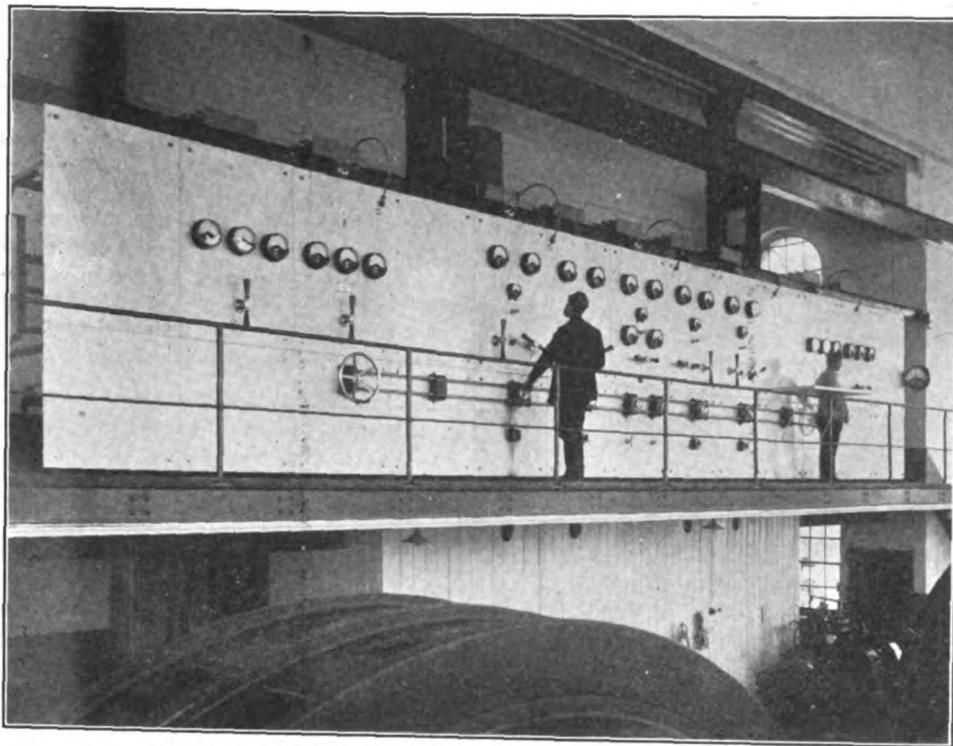


FIG. 3.—KANDER POWER HOUSE SWITCHBOARD, 4,000 VOLT SIDE.

was hired to come out from Boston and plan out the system, and, as the engineer remarked, he ought to know what he was about. Yes he ought to, but did he? Just look your plant over and see if there are any lines or counter-shafts that you could dispense with.

Another source of extra friction, which, of course, means wasted power, is in ill-fitted couplings which throw your shafting out of line.

"Yes, it is a trifle out," as an engineer said to me when I called his attention once to a hanger that was "wobbling," "but we cannot fix it, for the coupling is on crooked," and so he kept on shoveling coal costing \$4.65 per ton for the privilege of allowing that shaft to wobble.

Another thing which seems very strange to the uninitiated is how a man in a superintendent's position who knows little about power, aside from the fact that he once ran a machine of some kind, will set himself up as an authority in regard to where trouble lies when the shafting is out. But it is a fact, nevertheless, but when you come to analyze it you can often find a "method in his madness;" for instance,

Had the engines ever been "plugged" they might have yanked the shaft, but as they were condensing machines with a vacuum strong enough to keep them in motion several seconds after the steam was shut off, the agent's remarks merely caused a smile from those better informed.

Then, again, the bolts were a driven fit in the coupling, and had it been possible to have broken them by stopping and starting, they would have given away in the center instead of at the heads.

The correct solution of the trouble—which, by the way, all the machinists knew at the first—was found when putting in the new bolts; they were obliged to jack up one side of the coupling three-eighths of an inch to bring it level. It had simply worked open and shut with each revolution of the shaft until it had broken the bolt heads, all because it was out of level and the coupling situated just so as to catch the strain.

One of the best investments in cash a large establishment can make is to have its line shafting gone over often enough to be sure it is running with as little friction as possible.

Now it is not necessary to hire a professional millwright to properly hang a shaft; many a carpenter or ordinary machinist can do a very good job in this line. The tools and other appliances are very simple and easily obtained; the only other requisite is to know how, and every engineer at least should know that.

In determining the size of a line of shafting and the distance between hangers, it is better to have it too large and the hangers close than go to the other extreme, but there is a "happy medium," and it should always be looked for. No entirely exact calculation can be made to determine the limit of diameter of shaft and distance of supports, for the strain on a line of shafting is not a constant one.

Weights of shafts and pulleys may be calculated, but the absolute tension of belts, under varying circumstances of starting and stopping machinery, cannot be exactly determined. Formulae for these purposes are only in a measure correct. Suspending a length of shaft, with its weight of pulleys between supports to detect deflection, if any, makes no account of the variable strain of belts, nor is there any calculation in this trial for the rotary movement, and the centrifugal force developed and the vibration resulting.

In hanging a line of shafting, a strong fish line, or still better, what is known as a china line, is essential, and sometimes a fine steel wire is used. The wire, however, is apt to give trouble by sagging.

Of course this sag must be rectified as the hangers are placed, but very few really good men use it, the linen line being far better for getting the hangers in line. The leveling is done by means of a straight edge, a parallel-edged board, of six or eight inches in width. A spirit level on the upper edge of this board, the lower edge resting in the boxes, determines the level from box to box. The string ought not to be lined along the bottom of the boxes, because it is quite difficult to tell by the eye just where the center of the box is, but it should be drawn along the lower edge of the box where it is milled for the upper half or cap. In leveling hangers, shingles are a very handy adjunct for "shimming." After the shaft and pulleys are in place, it should all be gone over again with the level—for this it is well to have on hand a rectangular block of iron, eight inches or so in length by two inches square, planed perfectly true on two opposite faces. Then have one of these faces planed to a V recess—a right-angled gutter from end to end.

When this side is placed on any shaft up to three inches in diameter or more, the block will be in perfect line with the shaft, and a spirit level may be laid on it with certainty that it represents the true level of the shaft. The practice of trying to level by placing a spirit level on the shaft itself is apt to be misleading, for if it rests diagonally in the slightest degree it will not register level and then the pulleys often interfere to prevent its use.

There is another method which is very handy to try the level of shafts at all times. Make a strongly-braced rectangular frame of wood long enough to reach from the shaft to about four feet from the floor. The two side pieces of the frame have feet at right angles at their upper ends, so that they will fit upon the shaft as the iron blocks before mentioned. They also have a cross bar at the bottom, and one or more between that and the top, enough at least to make the frame rigid. If this frame

is properly made, a spirit level placed on the lower bar where it can be seen easily will show when the hooked ends rest on the shaft, whether it is level or not, and the width of the frame will allow it to be used without interference by the pulleys. In using this, it is always well to have it reach from one side of a hanger to the same side or end of the next, and it should not only be tried on each side of the hanger, but in the centers between them or as near it as it can be placed.

Couplings should be very accurately fitted to the shaft, and should receive a final facing up after being keyed to place. The bolt holes should be reamed through both halves of the coupling while they are on a short arbor exactly fitting the bore, or on the shafts, and the bolts should be made to fit the holes accurately.

Nothing is gained by placing one-half of a coupling to project and the other to allow the shaft to project, and to fit into it. This is only a fancied convenience in hanging. The portion of the shaft resting in the projecting half coupling does not tend in the least to strengthen the line. The bolts alone can do that.

There are patented couplings which are no doubt excellent in their way, but there are very few, if any, which are superior to the old flange coupling, or disk, so-called—two flanges with hub and smooth faces having a backward projecting rim extending over the hubs to cover bolt heads and nuts. The diameter of these increases by so much the stiffness of the shaft, and taken all in all, there are very few improvements upon them. There is no doubt that fully one-half of the shafting running to-day is out of line or not level. Now here is the complaint, also the remedy, and it ought not to be a hard matter to connect the two.—The "National Engineer."

LONDON NOTES.

(From our London Correspondent.)

The Underground Electric Railroads.

For half a dozen different reasons underground electric tube railways have been a pretty general subject for discussion in London electrical engineering and railway circles recently. The reports of the various companies have been issued and the results of the operations of the Central London, the City & South London, and the Waterloo and City lines—the three in actual daily working—during the year 1900 have naturally been receiving a great deal of attention. From a financial point of view the results are not calculated to support the boom for "tuppenny tubes." Several things are at once apparent, viz., that there has been proved to be a vast amount of traffic at hand ready for these underground systems, that the capital expenditure is enormously heavy, and that the methods of electrical operation are by no means finally decided. The Central London has carried enormous traffic and has had big receipts, but it has had heavy working expenses and finds itself face to face with conversion from one electrical system to another. The statements as to vibration troubles along the line of route are generally thought to be greatly exaggerated, and the attempts which are being made by some to prevent railway concessions being granted without precautionary vibration clauses being inserted

are considered by those in a position to form a generally correct estimate, to be without any prospect of success. The Board of Trade has, it is true, relegated the vibration difficulty to a committee of scientific eminence, and that committee has been speedily pushing on with its work, but the opinion of Mr. C. G. Mott, an old railway man, and chairman of the City & South London Electric Line, has just been expressed to the effect that any such clause cannot be inserted in any railway bill unless it appears in all, and if it appears in all, then railway enterprise will be brought to a standstill, and the public interests badly injured. Vibration is to be found along the line of any ordinary railway on the road surface and the populace is more or less accustomed to it. Mr. Mott's opinion is that the matter in connection with the Central London has been worked up in an exaggerated manner, and he is convinced that the Board of Trade report, when published, will prove how comparatively unimportant the vibration is. The trouble on the Central London is considered to have arisen from the great weight of the locomotives, and partly in connection with the permanent way construction. It is of interest to mention here that the City & South London Railway, which also operates on the locomotive principle, but with very small locos, has been perfectly free from complaints as to vibration annoyances ever since it commenced running, now nearly eleven years ago. Mr. Mott states that the reason of this is that the City & South London trains have always been made up as light as possible. To run light-weight short trains, and a very frequent service, has been the idea which has been followed up by the board, and this is maintained to be the right principle to follow in connection with these underground systems according to practical experience on the City & South London. It appears that the weight of an entire train on that railway (loco, carriages, etc.) is not more than the weight of the electric locomotive alone on the Central London. Both railways do a 2½ minute service at present. The City & South London runs a three coach train, and hopes shortly to run a four coach, so as to accommodate the early and late heavy traffic. But this weight question is stated (we quote the view of Mr. Mott and many others) to be at the root of the trouble, and the general opinion favors multiple units instead of electric locomotives. It appears to be practically certain that some system of multiple units will be adopted for the working of the Metropolitan undergrounds, although at the time of writing it is not definitely settled whether Ganz & Co. shall have the contract at \$2,000,000, or somebody else at a much larger figure. It does not appear probable that an English firm will secure this work after all, but it will be known in a few weeks for certain. It should be of some importance to American electrical promoters and financiers to watch the vibration question with the utmost care, for its effects upon the promotion and carrying out of the many other underground twin tunnel schemes for London cannot fail to be momentous, especially if enterprise is to be restricted by the imposition of hampering clauses such as mentioned. Mr. Mallock, who is an expert of some experience in the matters of train resistance and acceleration, etc., is acting upon the Board of Trade's express instructions, making a series of experimental investigations and observations as to the actual extent of the

vibration alleged to be caused. His report will have an important bearing.

The Waterloo & City Electric line, a quiet but very useful sort of line, which is a great convenience for certain cross London traffic but never gains much general advertisement in the daily press by being roundly abused like other electric lines are, is still going on satisfactorily. For the past half year it has paid its ordinary 3 per cent. dividend, has carried an extra quarter of a million passengers, making over 2,000,000 for the half year, and is doing fairly well on the whole. It is only a short line and not calculated to make any great stir in the "tube" way at any time.

The great Northern & City Railway Company, which is to run from the city out to Finsbury Park is making headway with its constructional operations. At present 2½ miles of tunnel have been completed and about a quarter of a mile is being added every month. Sir Charles Scotter, the leading spirit in this railway, says that "the construction of these underground works is complicated, difficult and expensive." Larger tunnels are being built than on the Waterloo & City, with which Sir Charles is also associated, as the advantages of larger tunnels are now being appreciated. They will admit of the largest rolling stock made, and will enable the carriages with side doors to be opened at the side when in the tunnels. This cannot be done on any of the existing electric lines and the point has been seriously brought forward in connection with stoppages which have occurred. The company will be able to adopt, if it thinks proper, the multiple unit system. This announcement is of some importance in view of the fact that originally heavy electric locomotives were intended and were stated in the public prospectus.

It only remains to add that the City & South London Railway has been passing through troublesome financial times lately. It never did pay much of a dividend and everyone was hoping that the opening of the extensions to Clapham and city would set things fairly on their feet. These two extensions have been working for six months, and the dividend for the half year is lowered instead of being increased and shareholders are now told to hope that in six months' time when the Islington extension is completed, things will finally turn the corner and the dividend improve. The capital outlay has been very heavy, and more is being spent every month on the Islington line, but there will be beyond a doubt a great accession of traffic from a vast northern area at present uncatered for as regards the city connection, when tubes run from Islington to Moorgate street and from thence to Clapham. These several sections are building up a system, which in future years will work in with other like lines, in a most convenient way.

To Exploit a New Invention.

A COMPANY has been organized at Vancouver to exploit an invention of Capt. Power, of Westminster, which utilizes the force created by the passage of a steamship through the water so as to accelerate the speed of the craft and supply power sufficient to light the vessel by electricity. A working model has been built and patent rights have been secured in several countries. New York men, it is said, have advanced part of the necessary capital, securing an interest in the invention.

CANADIAN NOTES.

(From our Ottawa Correspondent.)

The Manchester, Robertson & Allison Company has been incorporated at St. John, New Brunswick, with a capital of \$800,000 to supply electric light and power.

The town of Port Dover, Ont., is about to vote on a by-law to loan the sum of \$10,000 to the Canadian Steam Carriage Company to establish a factory for the manufacture of automobiles in that town.

The city council of Halifax, Nova Scotia, at a recent meeting, decided to at once install a municipal electric light plant, at an estimated cost of \$100,000. A special committee of the council has been appointed to select a suitable site for the power house.

The fire and light committee of the city council of Kingston, Ont., recently asked the Kingston Gas & Electric Light Company to name a figure which it would accept for its plants. The committee hoped to reach terms without the expense of an arbitration. The company, however, having announced its willingness to accept \$373,000, the council considered the proposition too high, and accordingly gave the committee instructions to proceed with arbitration. It is said that the price claimed by the company is double what an arbitration will likely award.

American Institute of Electrical Engineers.

As the regular date of the 151st meeting fell on Washington's Birthday, it was postponed by direction of the Committee on Papers and Meetings to Thursday, February 28, at 8:15 p.m. On that date a paper will be presented by Mr. William J. Hammer, entitled, "Important European Electrical and Engineering Developments at the Close of the Nineteenth Century." The following topics among others will be treated: Three-phase railroad work; telephonograph; Nernst lamp; Osmium lamp, etc.; high furnace gases and big gas engines; the "SO₂" engine, etc.; steam turbines; electric plowing; Langen suspended railroad, etc. The paper will be profusely illustrated with lantern slides. It is expected that Poulsen's telephonograph will be shown in operation.

Applications have been received from the following candidates which will be acted upon March 22d:

Wallace Clyde Johnson, Geo. Andros Thomson, James Remsen Strong, New York City.

Ray Mitchel Van Vleet, Dwight Carrington Rockwood, Edgewood Park, Pa.

Samuel Sumner Edmands, Columbus, O.

Arthur Langley Mudge, Montreal, Canada.

George A. Cooke, Honolulu, H. I.

Robert Wilson Bull, Palmerton, Pa.

Henry Allison Albin, Concord, N. H.

Winthrop Keith Howe, Buffalo, N. Y.

John Williams Thomas, Hokendauqua, Pa.

The Executive Committee will meet at 26 Cortlandt street at 3 p.m., on Thursday, February 28.

Proposals Invited.

The Treasury Department Supervising Architect at Washington, D. C., will receive sealed proposals until 2 p. m., March 18, for the completion (except heating apparatus, electric wiring and conduits) of the U. S. postoffice at New Brunswick, N. J.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended February 20:

Antwerp, 66 packages, \$11,567; Argentine Republic, 31 packages, \$1,288; Australia, 37 packages, \$2,037; Bradford, 95 packages motor trucks, \$6,525; Brazil, 46 packages, \$2,708; 65 packages electric railroad material, \$2,688; Bremen, 3 cases, \$1,082; Bristol, 2 crates trolley wagons, \$263; 38 cases, \$3,540; British East Indies, 2,751 packages, \$301,350; 9 packages, \$485; 9 cases motor vehicles, \$713; British Guiana, 19 packages, \$399; British West Indies, 3 packages, \$75; Brussels, 8 packages, \$178; Central America, 21 cases, \$373; Chili, 4 cases, \$60; Christiania, 1 package, \$89; Copenhagen, 1 package, \$30; Cuba, 29 cases, \$398; 1 crate auto vehicles, \$300; Danish West Indies, 1 package, \$8; Dutch West Indies, 2 packages, \$70; Ecuador, 6 packages, \$200; Gibraltar, 6 packages, \$1,300; Glasgow, 128 packages, \$17,581; 56 reels electric cable, \$20,873; Hayti, 1 case, \$17; 176 packages, \$18,089; Ipswich, 18 cases, \$2,500; Liverpool, 13 cases, \$2,750; 11 packages, \$400; London, 336 packages, \$12,222; 7 cases motor vehicles, \$5,000; Manchester, 3 packages, \$300; Mexico, 224 cases, \$4,844; 9 packages, \$5,000; Newcastle, 8 cases, \$1,600; 37 packages, \$5,583; Odessa, 26 cases, \$290; Rotterdam, 1 case motors, \$52; Southampton, 2 cases, \$132; Trieste, 1 case, \$75; 3 cases motor vehicles, \$850; Venezuela, 62 cases, \$988; Vienna, 3 cases, \$231.

PERSONAL MENTION.

Mr. Henry Rustin, chief of the Mechanical and Electrical Bureau of the Pan-American Exposition at Buffalo, N. Y., makes his headquarters on the Exposition grounds, and under his personal attention splendid progress has been made in the electrical installation which is destined to entertain and delight all who visit the Exposition.

Mr. L. C. Maddux, formerly of Kentucky, has succeeded Henry Spencer as manager of the Bristol, Tenn., exchange of the Cumberland Telephone Company.

INCORPORATIONS.

The Electric Insulation Company, Trenton, N. J. Capital stock, \$400,000.

The Chico Gas & Electric Company, San Francisco, Cal. Incorporators: John Martin, Fred H. Pierson, H. U. Roeding, H. R. Noack and William M. Pierson.

The H. E. Lindsey Electrical Supply Company, St. Louis, Mo. Capital stock, \$5,000. Incorporators: H. E. Lindsey, James F. Coyle, P. E. Chapman and D. W. Oviatt.

The Gannett Electrical Company, Brookings, S. D. Capital stock, \$30,000. Incorporators: W. Gannett, W. Gannett, Jr., and G. P. Hall.

The Big Bend Light & Power Company, Spokane, Wash.—to furnish electric light and power to towns on the Central Washington branch of the Northern Pacific.

The Douglas County Electric Company, Roseburg, Ore. Capital stock, \$10,000. Incorporators: L. A. Walker, H. Warren Smith and E. J. Walker.

The Magnolia Electric Light Company, Magnolia, Miss. Capital stock, \$10,000.

The Columbus, Findlay & Toledo Electric Power, Fuel, Light & Railway Company, Larue, O. Capital stock, \$10,000. Incorporators: A. J. Jones, J. H. Leonard, R. W. McVay, J. D. Miller, G. W. Kemp, M. J. Gottschalk and A. M. Hastie.

The London Power & Electric Company, London Mills, Ill. Capital stock, \$2,500. Incorporators: Frank Shelly, Frank J. Dains and Edgar S. Marston.

The Electric Laundry Machine Company, Chicago, Ill.

The Enterprise Electric Light, Heating & Power Company, Garner, Ia. Capital stock, \$25,000. Incorporators: E. C. Abbey, M. B. Cooper, F. E. Blackstone, C. S. Terwilliger, H. M. Andresen, J. W. Knadler, A. Kelly and G. E. Troeger, all of Garner.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED FEBRUARY 19, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

668,151. Trolley-Switch. Max D. Baron, New York City. Filed May 15, 1899.

668,158. Car-Fender. Peter Best, Elizabeth, N. J. Filed Dec. 11, 1899.

668,170. Electric Railway System. Ed. W. Farnham, Chicago, Ill. Filed Oct. 17, 1900.

668,174. Trolley Wheel and Harp. Joseph D. Forrer, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed June 8, 1900.

668,233. Brake for Electric-Railway Cars. Emmett W. Stull, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Dec. 12, 1899.

668,206. Trolley-Switch. Eugene J. Parker, Worcester, Mass., assignor, by direct and mesne assignments, of seven-tenths to Alexander S. Paton, Leominster, Mass. Filed Nov. 16, 1899. Renewed Dec. 13, 1900.

668,453. Trolley-Head. Henry A. Nettleton, Manchester, Conn. Filed Dec. 20, 1900.

668,588. Trolley-Wheel. Chauncey R. McAdoo, Indiana, Pa. Filed Dec. 1, 1900.

668,581. Trolley-Wheel and Bearing. Orien P. Martin, Akron, O. Filed July 30, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

668,246. Electric Lighting Apparatus. Alexander J. Wurta, Pittsburg, Pa., assignor to George Westinghouse, same place. Filed Aug. 19, 1899.

668,345. Electric-Arc Lamp. Thomas F. Barrett, Chicago, Ill., assignor of two-thirds to James P. Barrett and Fred C. Jones, same place. Filed Oct. 15, 1900.

668,446. Electric Light for Show-Windows. Sig Hirsh, New Haven, Conn. Filed Oct. 10, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

668,194. Rotary Field-Magnet for Electrical Machines. Benjamin G. Lamme, Pittsburg, Pa., assignor to the Westinghouse Electric & Manufacturing Company of Pennsylvania. Filed July 14, 1900.

668,235. Rheostat. Nathan H. Suren, Needham, Mass. Filed June 29, 1899.

668,260. Electrical Measuring Instrument. Karl Lehner, Frankfurt-on-the-Main, Germany. Filed Feb. 16, 1899.

668,389. Electric Switch. Willard F. Richards, Buffalo, N. Y., assignor to Charles M. Gould, New York City. Filed Nov. 23, 1899.

668,426. Testing Apparatus for Electric Circuits. Nathan H. Suren, Needham, Mass. Filed June 24, 1899.

668,440. Synchronizing Apparatus for Alternating-Current Generators. Herbert W. York, New York City, Filed May 11, 1900.

668,554. Electrical Relay and Circuit. Albert M. Bullard, Somerville, and Louis A. Falk, Boston, Mass., assignors to the American Bell Telephone Company, Boston, Mass. Filed Dec. 3, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

668,472. Holder for Telephone-Receivers. Horace M. York, Kennebunk, Me. Filed April 30, 1900.

MISCELLANEOUS.

668,215. Galvanic-Battery Electrode. Charles J. Reed, Philadelphia, Pa. Filed Sept. 14, 1897.

668,257. Electromagnet. George L. Foote, Brooklyn, N. Y. Filed Oct. 19, 1900.

668,282. Amalgamator. Caleb G. Collins, Woodmere, N. Y., assignor to Calvin Amory Stevens, New York City. Filed Jan. 4, 1899.

668,283. Amalgamation of Ores. Caleb G. Collins, Woodmere, N. Y., assignor to Calvin Amory Stevens, New York City. Filed Jan. 13, 1900.

668,284. Separator for Batteries. Leslie W. Collins, Chicago, Ill., assignor to the Collins Storage Battery Company, same place. Original application filed July 7, 1899. Divided and this application filed Feb. 9, 1900.

668,295. Storage-Battery Plate. Harry M. N. Muhle, Dayton, O. Filed Oct. 22, 1900.

668,300. Insulating-Support for Electrical Conductors. Henry E. Waite, San Francisco, Cal. Filed Nov. 16, 1900.

668,315. Receiver for Electrical Oscillations. Guglielmo Marconi, London, Eng., assignor to Marconi's Wireless Telegraph Company, Limited, same place. Filed July 17, 1900.

668,356. Electrical Accumulator-Battery. Paul E. Placet, Paris, France. Filed Nov. 14, 1899.

668,359. Electric Battery Contact. Arthur L. Stevens, New York City. Filed July 26, 1900.

668,429. Synchronizing System for Alternating Current Generators. Herbert W. York, New York City, Filed June 16, 1899.

668,488. Elevator Signal System. Martin H. Collum, Denver, Col. Filed April 9, 1900.

668,517. Storage-Battery Plate. John Hewitt, Chicago, Ill., assignor to the Hewitt Lindstrom Motor Company, same place. Filed June 12, 1900.

THE TELEPHONE WORLD.

Prof. Pupin's Cable Telephone System.

The first practical use of Prof. Pupin's cable telephone system will probably be in the establishment of direct long-distance connection with Cuba by the American Telephone & Telegraph Company, otherwise the Bell. The first move in this direction is through the Southern Bell Telephone Company, and again there is considerable speculation as to the relations between the Western Union and Bell interests.

Indications are not lacking that both are working to a common end in the South, and if this be true the Western Union must have been in some manner pacified for the loss it will suffer as a result of direct telephone connection with Cuba.

The Southern Bell Telephone Company is owned by the Western Union and the American Telephone & Telegraph Company. It has planned extensive developments to discourage independent competition in Virginia, Georgia, Alabama and Florida. The Southern Bell Company operates more than seventy exchanges, and now proposes to connect all feasible points with the long distance service and in-trench itself in Florida. Its expansion to the peninsula is understood to be part of the scheme to form connection with Cuba.

News from Chester, Pa., states that the Delaware & Atlantic Telephone & Telegraph Company, is getting ready to make a number of important improvements to both its local and long-distance service. It has just completed and added to its already large number of trunk lines, three more trunks, one each to West Chester, Coatesville and Newtown Square direct. This company has now twenty-seven direct trunk lines—ten to Philadelphia, three to Media, seven to Wilmington, two to Ridley Park and Darby, one to West Chester, one to Coatesville, one to Newtown Square, one to Claymont and Linwood and one to Moore. With all these trunk lines running to these important centers, and there connecting to all points of the United States, the citizens of Chester are promised superior and rapid long-distance telephone facilities. The local service of this company is also undergoing a number of changes. H. P. Ettlinger is the manager.

The citizens and business men of Gann Valley, S. D., the county seat of Buffalo County, are exerting their every effort at the present time toward the establishment of telephone communication with the outer world. Gann Valley's nearest railroad point is Kimball, twenty-two miles away, and the only means of communication is by stage. The business men are alive to the fact that by this condition of affairs Gann Valley and Buffalo County are losing trade and settlers. In the event of not securing a satisfactory proposition the citizens announce their intention of clubbing together and building a line to Kimball themselves.

The United Telephone & Telegraph Company of Philadelphia, Pa., has secured a controlling interest in the stock of the Independent Telephone Company, a Lancaster County concern, that was formed in opposition to the Pennsylvania Telephone Company. The deal involves stock worth \$210,000. The Independent Company was originally capitalized at \$150,000, but a month ago the capital stock was increased to \$300,000. The company has paid 5 per cent. dividends and has a surplus.

A stock company was formed at Hazard, Ky., a short time ago for the purpose of building a telephone line from Hazard to Jackson. The officers elected are as follows: President, B. J. Wootton; secretary, F. J. Eversole; treasurer, J. C. Boggs; general manager, C. X. Bowling. The company is known as the Jackson-Hazard Telephone Company, and it will erect lines to other mountain towns as soon as it completes the line from Hazard to Jackson.

The telephone company is advertising its goods in Portsmouth, N. H., by installing telephones that may be used until July free of charge for local calls. After July, if a continuance of the service be desired, the users will pay the usual rental. If not, the telephones are removed. Manager Wadsworth says that the scheme has not yet been introduced there this year.

The use of the telephone in Cairo and Alexandria, Egypt, has grown to such proportions that it has been found necessary to connect the two cities by a telephone trunk line.

The new telephone system in Scotland, S. D., is completed. It is proving a great success and will pay running expenses from the start.

The Interstate Telephone Company is stringing wires from Norristown to Newtown, Pa., where connections are to be made with the system of the Standard Telephone Company.

Telephone Expansion.

The following-named American telephone and telegraph subsidiary companies recently have increased their capital stock or are about to do so: The Rocky Mountain Bell Telephone Company, operating thirty-two exchanges in Utah and Montana, has increased its capital stock from \$842,000 to \$2,500,000 for improvements. The new stock will be issued as funds are required. The Central District & Printing Telegraph Company of Pittsburgh has voted to increase its capital stock from \$4,000,000 to \$7,500,000 for further development of its territory. This stock is listed on the Boston Stock Exchange. The Hudson River Telephone Company, operating in Albany, Poughkeepsie, Saratoga and other points in Northern and Eastern New York, will increase its capital stock from \$3,000,000 to \$4,000,000 for construction purposes. The capital stock was increased \$1,000,000 last March. The Chesapeake & Potomac Telephone Company, operating in Washington, D. C., and the State of Maryland, has made an additional issue of \$750,000 5 per cent. bonds, making the total issue to date \$1,250,000. The total authorized issue is \$1,500,000. At the time of the consolidation of the several subsidiary telephone organizations making up the New England Telephone Company in 1893, \$4,068,400 stock was issued to the American Bell Telephone Company for franchises, etc., and \$5,842,800 to other stockholders, making a total capital of \$9,911,200. Up to March 31, 1900, the capital has been increased for extensions and development to \$13,759,100, and bonds and debts created amounting to \$4,387,800. Add the probable cost of new extensions in 1900, estimated at \$2,000,000, and the total amount of capital employed to day will be \$20,146,900.

Reports of marked progress were the features of the annual meeting of the Providence Telephone Company held recently. Authority was given the board of directors to increase the capital stock from its present figures of \$1,200,000 to an amount not exceeding \$1,600,000. The growth during the past year has been the largest ever known, with a gain of nearly 1,200 new stations. There has been a marked gain in construction, including much underground work. Two new exchanges are now in process of construction, one in Attleboro and the other to be known as the Elwood Exchange in Providence. The following will hold office during the coming year: President, Dexter B. Potter; vice president, Fenner H. Peckham; secretary and treasurer, Charles T. Howard; general manager, Albert C. White; assistant general manager, Joseph F. Beck.

The Home Telephone Company of Findlay, O., has inaugurated an innovation in the matter of interurban lines. The company has secured a franchise for an exchange at Benton Ridge, a village ten miles west of there, and will make that a sub exchange to the Findlay office. In other words, the Benton exchange will be an integral part of the Findlay exchange and interurban communication may be enjoyed by patrons of the company with no additional charge. The company is also placing a large number of instruments in farmers' residences throughout Hancock County.

The Central Union Company of Noblesville, Ind., announced lately that it would give free communication to its subscribers with every town in Hamilton County, and it offers the same privilege to farmers having 'phones placed in their homes. A rate of 50 cents per month has been established for residences and a 10 cent rate between Noblesville and Indianapolis. Other reductions are proposed. The other companies in Hamilton County will likely meet the competition, although they have not yet taken action in the matter. This cutting on the part of the Central Union is thought to be due to the fact that the new company, which recently established a plant in Noblesville, is getting the bulk of the business.

The Butler exchange of the Ohio Telephone Company was recently sold at constable sale to the Central Union for \$200. Dissatisfaction among the stockholders caused the sale to be made.

The charter of the Stantonville Telephone Company of McNairy County, Tenn., was recently amended so as to increase the capital stock to \$2,000.

The American Telephone Company of St. Louis, Mo., has entered Western Kentucky and will branch out among the prosperous towns of that section.

The Gallipolis, O., Telephone Company has increased its capital stock from \$30,000 to \$50,000.

The Sunset Telephone Company is completing a \$15,000 three story telephone building in Tacoma, Wash. It will be ready for use in April.

To Telephone from Ocean to Ocean.

It is announced in Tacoma, Wash., that within a year, in all probability, one will be able to telephone from Puget Sound clear across the country to Chicago and New York. It is believed that next summer will see made a practical test of telephoning from Tacoma to New York. The route westward from New York will be to Chicago, Kansas City and Denver, thence to Salt Lake, Butte City, Spokane and Tacoma.

During the coming summer the Rocky Mountain Bell Telephone Company will string a line from Big Timber to Billings, Mont., and later to Miles City. Another line will be built from Butte to Bozeman. The Northwestern Telephone Company of Minneapolis now has a line working as far westward as Bismarck. But a comparatively small gap will thus be left between Miles City and Bismarck. By the time this gap is filled the Montana cities will be connected with Spokane, Wash., and the ocean-to-ocean telephone line will then be complete.

The Queen City Telephone Company, an independent line, which has been the rival of the Bell Company for a number of years in Charlotte, N. C., has gone into the hands of a receiver, Dr. J. F. Robertson being named; as receiver. The plant will be sold on March 18. Until that date it will be operated by the receiver. It is thought that the plant will find a purchaser and be continued on even a more satisfactory basis than before. The outstanding claims against the company caused the stockholders at their last meeting to take steps which resulted in the receivership. Capt. J. H. Wiley, of Salisbury, N. C., is president of the Queen City Telephone Company, and J. H. Helvin general manager.

The Independent Telephone Association of the State of Wisconsin ended its third annual meeting in Madison a short time ago. The following officers were elected: President, A. L. Hutchinson, of Weyauwega; vice-president, C. P. Schweizer, of La Crosse; secretary and treasurer, H. C. Winter, of Madison; executive committee, Richard Valentine of Janesville, F. H. Sweet of Fond du Lac, J. C. Harper of Madison, J. A. Gaynor of Grand Rapids, W. F. Gunaer of Appleton. It was decided to hold an adjourned meeting at La Crosse in June, and the next annual meeting in Milwaukee in February.

At the recent annual meeting of the Central New York Telephone & Telegraph Company held in Utica, N. Y., C. J. French of Boston, Martin A. Knapp of Syracuse, Lewis H. Lawrence, Charles A. Nicholson, Frederick T. Proctor, Charles B. Rogers, Joseph Rudd and Francis G. Wood of Utica and Jeffries Wyman of Boston were elected directors. Lewis H. Lawrence was chosen president, Joseph Rudd, first vice-president and Jeffries Wyman second vice-president for the ensuing year.

The Reusselaer, N. Y., Telephone & Telegraph Company, with a capital of \$150,000, with a privilege of increasing it to \$500,000, has been formed to operate in Troy, Watervliet, Green Island, Waterford, Cohoes and Schenectady. The directors are John H. Gleason, Edward F. Murray, John J. Smith, E. E. Summey, Charles Maloney, Joseph H. Broder, fck, Joseph H. McCarthy, W. H. Hollister and Thomas J. Mooney.

The Bell Telephone Company is assuming the contracts of the New State Telephone Company in Mt. Clemens, Mich., and it is quite likely that the New State office will shortly be done away with and all 'phones connected with the Bell Company's board. Those who keep New State contracts will not be given Bell connections.

The Hanover, Pa., Telephone Company has sold the franchise and plant of the company to Samuel L. Johns, of McSherrystown, Pa., acting in the interest of T. J. O'Neill, of Hanover, under whose management the business will hereafter be conducted.

Stockton, N. Y., is to have a new telephone system. The stockholders are chiefly residents of that village.

TELEPHONE INCORPORATIONS.

The Tri-County Telephone Company, Greenwich, O. Capital stock, \$25,000.

The Olds Telephone Company, Des Moines, Ia. Incorporators: P. J. Alvine, H. K. Smith, C. O. Nelson, J. M. Anderson and J. E. Lindeen.

The Home Telephone Company, Bloomfield, Ind. Capital stock, \$15,000. Directors: John F. Slinkard, Gilbert H. Hendren, Ziba P. East.

The Genesee Valley Telephone Company, Rochester, N. Y. Capital stock, \$100,000. Directors: J. Foster, Warner, G. R. Fuller and E. M. Higgins, all of Rochester.

GENERAL ELECTRICAL NEWS.

Lighting.

Centerville, Ala.—There is a prospect of having waterworks and an electric light plant here. The matter is being discussed, and ex-Sheriff Robert Vance says he will put a plant in at once.

Clarence, Mo.—Clarence will soon vote on the electric light proposition.

Coushatta, La.—There is a movement on foot to establish an electric light plant here in the near future. Frank Pierson is interested in the scheme.

Dodge, Neb.—F. J. Erb is contemplating putting in an electric light plant here.

Dublin, Ga.—This city will determine March 12 an issue of \$25,000 of bonds for enlarging the electric light plant.

Dundee, Ill.—The question of electric lighting for West Dundee will be submitted to the voters at the coming spring election.

Elberton, Ga.—The establishment of a municipal electric light plant is being considered.

Franklin, Ind.—A franchise has been granted here to a Chicago capitalist for an electric light plant.

Fulton, N. Y.—A new company will soon try to get the franchise for lighting the streets of this place.

Hiram, O.—The streets of this place are to be lighted by electricity.

Homer, Ill.—The Homer Light & Power's Company's plant has been purchased by G. C. Bowen, who contemplates making extensive improvements.

Humeston, Ia.—The citizens are agitating the electric light question.

Huntingburg, Ind.—Messrs. W. and C. Miessner are preparing to purchase new machinery for the electric light plant.

Joliet, Ill.—Hamer H. Green of Bloomington, and a member of the Joliet Board of Penitentiary Commissioners, says that the waters of the Desplaines River would furnish light and power for the prison and save the State a vast sum spent for coal.

Kinsley, Kan.—The city council contemplates the erection of an electric light plant.

Lyons, N. Y.—Over \$10,000 will be expended by the Wayne County Electric Light & Power Company in new machinery at the Lyons plant. New machinery will also be installed at the Newark and Palmyra plants.

Macon, Ill.—J. F. Van Gundy will put in a complete electric light plant here.

Manchester, Vt.—There is said to be a good prospect that an electric light and power plant will be put in this place next spring. The power will be taken from Bourn pond, about nine miles back in the mountain. Ample power for the proposed electric railway from here to Granville, N. Y., will be obtainable. The capital will be furnished by out-of-town parties.

Midway, Ky.—The electric light question is being discussed here.

Northfield, Vt.—The Bolton Falls Power Company has submitted a proposition for the purchase of the Northfield electric light plant.

Odebolt, Ia.—An electric light company will soon be formed here with \$32,000 capital stock, and it proposes to erect an electric light plant.

Orange, Tex.—P. H. O'Day, manager of the Electric Light & Ice Works, has received orders to dispose of all of the dynamos and other electrical machinery now in use here, with a view of putting in a much larger system.

Peru, Neb.—J. A. Hays was lately granted a franchise to establish an electric light plant here.

Pomeroy, Wash.—At a recent meeting of the city council an ordinance was passed granting H. M. Thatcher an electric light and power franchise for five years.

Reinbeck, Ia.—The city council is discussing the electric light question.

Sharpsburg, Pa.—The city council has passed an ordinance providing for an election on April 4 on the matter of securing improvements in the borough electric light supply.

St. Joseph, Mich.—Business men of this place have

decided to build and donate to the city a \$15,000 electric lighting plant.

Somerville, Tenn.—This city will issue bonds for the erection of an electric light plant.

Syracuse, N. Y.—Dr. J. L. Wente of Scranton, Pa., contemplates the erection of an electric light plant in this city.

White Pigeon, Mich.—The citizens are agitating the question of erecting a new electric light plant.

Winchester, Tenn.—This city is investigating the cost of constructing an electric light plant.

Street Railways.

Barnesville, O.—There is talk here of an electric line connecting this place with several towns of this vicinity, and it is said that Wheeling men are interested in the project.

Chicago, Ill.—Articles of incorporation were lately filed with the Secretary of State by C. E. Crafts for the Chicago & Desplaines Valley Electric Railway with \$1,000,000 capital stock.

Cortland, N. Y.—The Cortland & Homer Traction Company, using electricity for its motive power, is to be further extended to Glen Haven where it will connect with the Skaneateles & Auburn trolley road. A consolidation of the two is contemplated, and the first-named road will increase its capital and issue additional bonds. Particulars may be had of the secretary and general manager, H. B. Westcott, 24 Main street, Cortland, N. Y.

Creston, Ia.—This city, Winterset and Macksburg, have united in a movement to give Creston an electric line connecting the points mentioned.

Cumberland, Md.—The Penn State Construction Company of Philadelphia has been granted a franchise by the county commissioners to build an electric line from here to Western Port, a distance of 30 miles. The cost is estimated at \$500,000.

Detroit, Mich.—The Wyandotte & Detroit River Electric Railroad, running from this city to Trenton, a distance of nine miles, was purchased last week from J. C. Hutchins, of Detroit; A. B. Dupont, of St. Louis, and the other owners by the Detroit United Railway.

Durham, N. C.—R. H. Wright is president of the Durham Traction Company that will build an electric car line here.

Elmwood, R. I.—A recent fire in the car sheds of the Union Railroad here destroyed one of the buildings and gutted another. Thirty trolley cars were burned valued at \$97,000. The total loss will reach \$102,000, covered by insurance.

Hodgenville, Ky.—Dr. J. C. Jones, of Buffalo, is making an effort to organize a stock company for the purpose of building an electric car line between this place and Buffalo. The distance is six miles.

Independence, Kan.—The county commissioners have granted a franchise to G. T. Guernsey, T. H. Stanford and I. B. Wallace of this city for an electric railway between here and Cherryvale, a distance of nine miles. The road will cost \$150,000.

Milwaukee, Wis.—The Milwaukee, Burlington & Lake Geneva Railway Company has filed articles of incorporation. It is an electric line to carry freight and passengers. The capital stock as now filed is \$100,000, but this will be increased two or three millions if the plan goes through.

New York City.—George H. Pegram, chief engineer for the Manhattan Railway Company, filed plans last week for a new two and three story brick station to be used for storing and distributing electric power for the new third-rail system with which the road is being equipped.

New Haven, Conn.—Fire recently destroyed the power house of the Winchester Avenue Electric Railroad Company.

Pine Bluff, Ark.—W. H. Langford is interested in a company to build an electric line in this place.

Savannah, Ga.—The Savannah Street Railway Company is considering the building of an electric line to

Montgomery. L. H. McIntire is manager of the company.

Spearfish, S. D.—An electric line from here to the mining camps is being discussed. It is rumored that Lead has subscribed \$75,000 toward such an enterprise and this city is to put up \$60,000.

Stroudsburg, Pa.—The chances for the changing of the Stroudsburg Passenger Railway power from steam to electricity are good.

Tiffin, O.—The Toledo, Tiffin & Sandusky Electric Railway will be built from here to Fremont early in the spring. Judge J. I. Bunn of this city is one of the directors of the company.

Manufacturing.

Cleveland, O.—The Van Dorn-Elliott Electric Company was formed a short time ago with \$50,000 capital to manufacture electric apparatus. J. H. Van Dorn, H. H. Hodel, F. Schneider, W. A. Dutton and W. H. Elliott are interested in the enterprise.

Fairfax, Va.—The Southern Incandescent Lighting Company, of which J. P. Machen is secretary, wants to correspond with manufacturers of incandescent lamps.

New York City.—George Stein, W. V. Langlos and C. F. Kabisch of this city are all interested in the recently formed company, known as the Stein & Langlos Electric Manufacturing Company, and capitalized at \$10,000.

Peabody, Mass.—The American Aaron Meter Company of this place will install new machinery and manufacture electric meters.

Trenton, N. J.—The Stanley Electric Manufacturing Company held its recent annual election of officers at the office of the John A. Roebbling's Sons Company. The following officers were elected for the ensuing year. Dr. F. A. C. Perrine, president; W. W. Gamwell, treasurer, and W. Taylor, secretary.

Watsonville, Pa.—The American Electric Appliance Company, which operates a plant here, has leased the plant of the Marcus Hook Iron Works, and will manufacture engines and dynamos.

Company Matters.

Cincinnati, O.—The Jones Brothers' Electric Company has just increased its capital stock from \$164,000 to \$400,000.

Power and Transmission.

Salt Lake City, Utah.—A petition was recently presented to the county commissioners by L. L. Nunn, the chief stockholder and authorized representative of the Telluride Electric Power Company of Provo and the Hercules Electric Power Company of Logan, requesting a franchise for constructing and operating an electrical transmission line of poles and wires over the highways in Salt Lake County.

Automobiles.

Champaign, Ill.—The Illinois Motor Transit Company with a capital of \$50,000 has been formed to operate automobiles. John Armstrong, John T. Ainsworth and S. D. Enoch are back of the enterprise.

Cincinnati, O.—A company in which Emmett P. Gray, Otto Armleder, Albert Leisure, Benjamin A. Wright and S. A. Ramsey are interested will equip a plant and begin the manufacture of automobiles at once.

Faribault, Minn.—The Chicago Electric Vehicle Company of this city now manufactures every part of its electric vehicles, including the batteries, at its factory here.

New Haven, Conn.—Senator Kennedy has introduced a bill incorporating the Truck Automobile Company of New Haven with a capital stock of \$1,000,000 for the purpose of carrying on a general trucking business by automobiles.

Springfield, O.—L. P. Brenning, formerly of Salem, Mass., has commenced the manufacture of automobiles in this city.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by **ELECTRICITY** from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Authorz'd	Issued.				
Albany, N. Y.—Feb 25					
United Traction.....	100	\$5,000,000	\$5,000,000 1½ % Q.	109	110
(Consolidation of the Albany and Troy City Railway.)					
Allentown Pa.—Feb 5					
Allentown & Lehigh Val. Trac. Co.	100	4,000,000	1,800,000	—	15
Bridgeport, Conn.—Feb 25					
Bridgeport Traction Co.	100	2,000,000	2,000,000 1 % Aug.	100	—
Baltimore Md.—Feb 25					
United Railways & Elec. Co. com.	50	24,000,000	18,000,000	18½	18¾
Boston, Mass.—Feb 25					
New England Street Ry.	25	5,000,000	1,081,925 1 % Q., Jan. 15,	—	—
North Shore Traction Co. com.	100	4,000,000	4,000,000	15	16
North Shore Traction Co. pfd.	100	2,000,000	2,000,000 6 % S. A. & O.	85	87
West End Street Ry. Co. com.	50	10,000,000	4,080,000 8 % S. Oct., '99.	98	98½
West End Street Ry. Co. s. pfd.	50	4,400,000	6,400,000 4 % S., Jan.	112	118
Boston Elevated R. R.	100	10,000,000	2 % S. Aug. 99,	169	170
Brooklyn N. Y.—Feb 25					
Brooklyn City Ry.	100	2,000,000	1,928,400	235	240
Brooklyn Rap. Transit Co., tr. cert.	100	48,000,000	48,000,000	73	76
Brooklyn Heights Railroad.	100	200,000	200,000	107	109
Brooklyn City RR. guar.	100	12,000,000	12,000,000 8 % S. Q., Jan.	237	239
Brooklyn Queens Co. & Sub. RR.	100	2,000,000	2,000,000	—	—
Coney Island & Brooklyn RR.	100	2,000,000	1,884,200 2 % S. Nov., '99.	325	332
Kings County Elevated.	100	4,750,000	4,750,000	—	—
Kings County Traction Co.	100	4,500,000	4,500,000 1 % July	—	—
Nassau Electric Railroad. pfd.	50	6,000,000	6,000,000	75	80
Atlantic Avenue Railroad.	50	2,000,000	2,000,000	—	—
Brooklyn, B. & W. R. Railroad.	100	1,000,000	1,000,000	—	—
Buffalo N. Y.—Feb 25					
Buffalo & Niagara Falls Elec. Ry.	100	1,250,000	1,250,000	74	75
Buffalo Railway Co.	100	6,000,000	5,870,500 1 % Q. Dec., '99.	99	100
Columbus O.—Feb 25					
Columbus Street Railroad.	100	8,000,000	8,000,000 1 % Q., Feb.	36	39
Columbus Street Railroad, pfd.	100	1,500,000	1,500,000	92	98
Charleston, S. C.—Feb 25					
Charleston City Ry. Co.	50	100,000	100,000 8 % S.	—	—
Enterprise City RR. Co.	25	1,000,000	250,000	—	—
Chicago, Ill.—Feb 25					
Chicago City Ry. Co.	100	12,000,000	12,000,000 8 % Q., Dec. 31, '99.	255	260
Chicago & South Side R. T. RR.	100	10,828,800	10,828,800	9½	10
Lake Street Elevated RR.	100	10,000,000	10,000,000	24	25½
Metropolitan West Side Elev. Ry.	100	15,000,000	7,000,000 Feb 28 1900.	79	80
Met. West Side El., pfd.	100	15,000,000	9,000,000	208	210
North Chicago Street RR.	100	10,000,000	6,000,000 8 % Q., Jan.	197	200
North Chicago City RR.	100	500,000	249,900	99½	100
South Chicago City Railway.	100	2,000,000	1,608,200	101½	101½
West Chicago St. RR. Co.	100	20,000,000	18,189,000 1½ % Q., Feb.	14½	14½
Union Traction Ry. com.	100	1,250,000	624,900 35 %	57½	57
Union Traction Co. pref.	100	2,000,000	2,000,000 5 % S.	—	—
Cincinnati, Ohio.—Feb 25					
Cincinnati Inc. Plane Ry. com.	50	1,000,000	575,000	—	—
Cincinnati Inc. Plane Ry. pfd.	50	150,000	150,000 ½ % Feb.	75	76
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000 2½ % Feb.	124½	125
Cincinnati Street Ry. Co.	50	18,000,000	14,000,000 1½ % Q., Jan.	126½	127
St. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000 1½ % Q., Jan.	—	—
Cleveland, Ohio.—Feb 25					
Akron, Bed. & Clev. Elec. Ry.	100	1,000,000	1,000,000 ¾ % Jan.	48	50
Cleveland City Ry.	100	8,000,000	7,600,000 3-5 % Jan.	102	102½
Cleveland Electric Ry.	100	12,000,000	12,000,000 ¾ % Q., Oct., '99.	83	84½
Detroit, Mich.—Feb 25					
Detroit Citizens' Street Ry.	100	2,000,000	1,250,000	100½	—
Pt. Wayne & Belle Isle Ry.	100	1,200,000	1,200,000	175	—
Rapid Railway Co.	100	250,000	250,000	90	100
Detroit Electric Railway.	100	1,000,000	1,000,000	—	—
Wyandotte & Detroit River Ry.	100	250,000	200,000	100	110
Dayton O.—Feb 25					
City Railway Co. com.	100	1,500,000	1,470,600 1½ % Q.	140	145
City Railway Co. pfd.	100	600,000	600,000 1½ % Q.	170	—
People's Street Railway.	100	1,100,000	1,100,000	114	115

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Authorz'd	Issued.				
Hartford Conn.—Feb 25					
Hartford Street Ry. Co.	100	\$4,000,000	\$200,000 8 % S. Oct.,	150	—
Hartford & West Hartford RR.	100	1,000,000	247,000	—	—
Holyoke Mass.—Feb					
Holyoke Street Ry. Co.	100	400,000	400,000 8 % A., June,	207½	212
Hoboken N. J.—Feb 25					
North Hudson Co. (N. J.) Ry. Co.	25	1,250,000	1,000,000 8 %	180	—
Indianapolis, Ind.—Feb 25					
Indianapolis Street Ry.	100	5,000,000	5,000,000	27	29
Lancaster, Pa.—Feb 25					
Pennsylvania Traction Co.	100	10,000,000	9,900,000	—	—
Lancaster & Col. Electric Ry.	100	—	87,500	—	—
West End Street Railway.	100	—	—	—	—
Louisville, Ky.—Feb 25					
Louisville Ry. com.	100	4,000,000	8,500,000 1½ % April.	82	83
Louisville Ry. pfd.	100	2,500,000	2,500,000 2½ % S. Oct. 1,	112	118
Minneapolis, Minn.—Feb 25					
Twin City Rapid Transit. com.	100	17,000,000	15,010,000	66½	68½
Twin City Rapid Transit. pfd.	100	8,000,000	1,712,200 1½ % Oct.	136	137
Montreal, Canada.—Feb 25					
Montreal Street Ry. Co.	50	4,000,000	4,000,000 8 % S. M. & N.	263½	265
Toronto Street Ry. Co.	100	6,000,000	6,000,000 1½ % S. J. & J.	105½	109½
Memphis Tenn.—Feb 25					
Memphis Street Railway Co.	100	500,000	500,000	25	—
New Haven, Conn.—Feb 25					
Fair Haven & Westville RR.	25	2,000,000	2,000,000 8 % S. Sept.	39	41
New Haven Street Railway Co.	100	1,250,000	1,000,000 2½ % A., July	—	—
New Haven & Centerville.	100	700,000	800,000	—	—
Winchester Avenue RR.	25	1,000,000	600,000	45	46
New Orleans, La.—Feb 25					
Canal & Claiborne RR. Co.	40	240,000	240,000 4 % S. July,	—	—
New Orleans & Carrollton RR.	100	1,200,000	1,200,000 1½ % Q., Oct.	148½	158
New Orleans Traction Co. new com.	100	—	—	22½	24
New Orleans Traction Co. new pfd.	100	—	—	96	96
Orleans City RR. guar.	100	2,000,000	2,000,000 8 % S. Jan.	20½	26
Orleans & Lake RR. guar.	100	2,000,000	2,000,000 4 % S. Jan.	—	—
Orleans Railroad.	50	500,000	185,000 1½ % June,	—	—
St. Charles Street Railway.	50	1,000,000	1,000,000 1½ % Oct.	56½	57
New York—Feb 25					
Central Croton RR.	100	500,000	500,000 2½ % Q.	255	300
Christopher & 10th Sts. RR. guar.	100	650,000	650,000 2½ % Q., Oct.	175	185
Dry Dock, E. B'way & Battery RR.	100	1,200,000	1,200,000 1½ % Q., Nov.	120	125
Metropolitan Street Ry. Co.	100	45,000,000	45,000,000 2½ % Q., Feb., 1900.	161½	162
Bleecker St. & Fulton Fy. Ry. guar.	100	900,000	900,000 2½ % A., July,	85	87
Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000 2½ % Q.	282	240
Gen. Park, N. & E. Rivers RR. guar.	100	1,800,000	1,800,000 2½ % Q.	192	200
8th Avenue RR.	100	1,000,000	1,000,000 4½ % Q.	390	405
42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	392	402
9th Avenue RR. guar.	100	800,000	800,000	198	201
10th Avenue RR. guar.	100	2,000,000	2,000,000	205	225
Twenty-third St. R. R. Co. guar.	100	600,000	600,000 4½ % Q.	400	410
Second Avenue RR.	100	2,500,000	1,862,000 2½ % Q., Jan.	188	201
Third Avenue RR.	100	12,000,000	10,000,000 \$1.75 p. sh. Feb.	121	121½
42d St., Manhattan & St. Nich. Av.	100	2,500,000	2,500,000	65	75
Union (Huckleberry) Ry.	100	2,000,000	2,000,000	190	200
Newark N. J.—Feb 25					
Consolidated Traction Co. of N. J.	100	15,000,000	15,000,000	61	61½
North Jersey Railway Co.	100	6,000,000	6,000,000	24½	25
United Elec. Co. of New Jersey.	100	504,000	504,000 11½ % A.	22	24
Pittsburg, Pa.—Feb 25					
Allegheny Traction Co.	50	500,000	100,000	27	28
Consolidated Traction Co. com.	50	15,000,000	15,000,000 2½ % Jan.	25½	26
Consolidated Traction Co. pfd.	50	9,478,850	9,478,850 1½ % Nov.	65½	66
Central Traction Co.	50	1,500,000	1,500,000 1½ % Nov.	75½	78
Citizens' Traction Co.	50	8,000,000	8,000,000 6 % A.	72½	73½
Duquesne Traction Co.	50	8,000,000	8,000,000 6 % A.	—	—
Pittsburg Traction Co.	50	2,500,000	2,500,000 8½ % Nov.	—	—
Federal St. & Pleasant Valley Ry.	25	1,400,000	1,400,000 2½ % July,	37	39
Pgh., Allegheny & Man. Trac. Co.	50	8,000,000	8,000,000 2½ % Aug.	—	—
Pittsburg & Birmingham Trac. Ry.	25	1,500,000	1,500,000 1 % Oct.	41	42½
Pittsburg & West End Ry.	50	8,000,000	8,000,000 5 % A., June	—	—
United Traction Co. com.	50	17,000,000	17,000,000 J. & J.	15	15½
United Traction Co. pref.	50	8,000,000	8,000,000 J. & J.	50½	51

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.
b Leased to Boston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
g Owned by Atlantic Ave. RR. and leased to Nassau system.
h \$20 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; \$250 100 of stock owned by North Chicago Street Railroad Company.
i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
j \$5 per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,100 of stock owned by West Chicago Street Railroad Company.
k Majority of stock owned by Chicago, West Division Railway Company; 5 % on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
c Leased to Central Croton Railroad at 8 % on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavyonia Ferry—now Metropolitan Street Railway.
g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1895, at \$215,000 per annum.
i Leased to Metropolitan Street Railway for 18 % on stock.
j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.
k Leased to Metropolitan Street Railway for \$145,000 per annum.
l Leased to Metropolitan Street Railway for 18 % on capital stock.
m Controlled by Third Avenue Railroad by purchase.
n Dividends of 1½ % yearly guaranteed by Consolidated Traction Company.
o Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.
p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
q Leased to Fort Pitt Traction Company for 6 % on \$8,000,000 capital stock.
r Leased to Consolidated Traction Company for 4 % on capital stock.
s Leased to Consolidated Traction Company for 7 % on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Capital Stock.		Rate and Date of Last Div.	Esd.	Asked.	NAME.	Capital Stock.		Rate and Date of Last Div.	Esd.	Asked.
	Par	Authorized					Par	Authorized			
New Bedford Mass.—Feb 25	100	\$350,000	\$350,000	2 %	Feb.	160	165				
Union Street Railway Co.	100	800,000	225,000	4 %	A., June.	170	178				
Northampton, Mass.—Feb 25	100	800,000	225,000	4 %	A., June.	170	178				
Northampton Street Ry.	100	800,000	225,000	4 %	A., June.	170	178				
Omaha, Neb.—Feb 25	100	5,000,000	5,000,000	3 %	A. and N.	55	65				
Omaha Street Ry.	100	5,000,000	5,000,000	3 %	A. and N.	55	65				
Paterson, N. J.—Feb 25	100	1,250,000	1,250,000			54	—				
Paterson Ry. Co.	100	1,250,000	1,250,000			54	—				
Providence, R. I.—Feb 25	100	8,000,000	8,000,000	3 %	Oct. '98	110	111				
United Traction & Electric Co.	100	8,000,000	8,000,000	3 %	Oct. '98	110	111				
Philadelphia.—Feb 25	50	2,000,000	1,770,000	2 %	Dec. '98	28	24				
Fairmount Park Trans. Co.—\$50 pd.	50	1,966,100	1,966,100	2 %	July 15, '99	47	48				
Hestonville, Man. & Fairmount.	50	538,900	538,900	2 %	July 15, '99	75	76				
Hestonville, Man. & Fairmount.	50	800,000	800,000	3 %	Feb. 1, '99	75	76				
Fairmount Pk. & Had. Pass. Ry.	50	800,000	29,980,450			82 3/4	34				
Union Traction Co.—\$12 1/2 pd.	50	800,000	29,980,450			82 3/4	34				
Electric Traction Co.	50	500,000	192,500	3 %	share Q.	445	—				
Ottisens' Passenger Ry.	50	1,000,000	1,875,000	14 share A—Apr	98	450	—				
Frankford & Southwark Pass. R.	25	1,000,000	1,000,000	A. & O.		90	90 1/2				
Lehigh Avenue Ry. Co.	25	1,000,000	1,000,000	A. & O.		90	90 1/2				
Lombard & South Street Ry.	50	1,060,000	771,076	3 %	share A, Mar. '98	800	—				
Second & Third Streets Ry.	50	10,000,000	16,000,000	3 %	A., April, '98	100	—				
People's Traction Co.	50	1,500,000	572,800	5 %	share—1898.	150	151				
Germantown Passenger Ry.	50	500,000	150,000	3 %	Jan., 1898.	151	152				
Green & Coates Passenger Ry.	25	1,500,000	740,000			—	—				
People's Passenger Ry.—com.	25	750,000	277,402			—	—				
People's Passenger Ry.—pfd.	25	750,000	277,402			—	—				
Philadelphia Traction Co.	50	80,000,000	120,000,000	32 p. sh., Oct. '98.		100	100 1/2				
Catherine & Bainbridge St.	50	1,000,000	400,000	6 %	A—Mar., '98.	158	157				
Continental Pass. Ry.—guar.	50	1,000,000	580,000	8 %	share—July, '98.	158	157				
Empire Passenger Ry. Co.	50	1,000,000	600,000			—	—				
Philadelphia City Pass. Ry.	50	1,000,000	475,000	7 %	share July '98	208	208 1/2				
Philadelphia & Gray's Ry. R.R.	50	1,000,000	298,650	3 %	share July '98	100	—				
Ridge Avenue Passenger Ry.	50	750,000	420,000	12 %	share, July '98.	306 3/4	809				
Philadelphia & Darr, Ry. guar.	50	—	200,000	12 %	share July, '98.	—	—				
17th & 19th Sts. Pass. Ry. guar.	50	—	250,000	1 %	share, July, '98.	—	—				
Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	885,000	11 %	share, July, '98	300	—				
Union Passenger Ry. Co.	50	1,500,000	900,000	8 %	share, July '98	289	240				
West Philadelphia Pass. Ry.	50	750,000	750,000	10 %	share, July '98	262	263				
Rochester, N. Y.—Feb 25	100	5,000,000	5,000,000			20	23				
Rochester Railway Co.	100	5,000,000	5,000,000			20	23				
Reading, Pa.—Feb 25	100	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26					
Reading Traction Co.	100	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26					
City Passenger Ry.	50	850,000	850,000	Jan., '98.	133	—					
East Reading Electric Ry.	50	1,000,000	1,000,000	Jan., '98.	70	—					
St. Louis Mo.—Feb 25	100	800,000	150,000			—	—				
South Street & Arsenal Ry.	50	400,000	400,000	2 %	Dec., 1898.	—	—				
Jefferson Avenue Ry. Co.	50	2,500,000	2,400,000	1 %	Jan., '99.	—	—				
Lindell Ry.	50	2,500,000	2,479,000	1 %	Jan., '99.	—	—				
National Railway Co.	—	2,500,000	2,500,000			—	—				
Cass Avenue & Fair Grounds.	—	2,500,000	2,500,000			—	—				
Oldtown RR.	100	2,000,000	1,500,000	4 %	Oct., '98.	—	—				
St. Louis RR.	100	2,000,000	2,000,000	2 %	Jan., '99.	—	—				
Missouri RR.	50	2,400,000	2,800,000	1 %	Jan., '99.	25 1/2	25 1/2				
People's RR. Co.	50	1,000,000	800,000	50c.	Dec., '98.	78	79				
United Electric Ry.—com.	50	500,000	500,000			63	65				
United Electric Ry.—6 % pref.	100	1,000,000	1,000,000	3 %	Jan., '99.	68	70				
St. Louis & Suburban Ry.	100	2,500,000	2,500,000			68	70				
Union Depot RR.	100	4,000,000	4,000,000	3 %	A., July, '99.	—	—				
San Francisco, Cal.—Jan	100	1,000,000	600,000	50c. monthly.		117	119				
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.		117	119				
Geary Street Park & Ocean RR.	100	1,000,000	600,000	50c. monthly.		117	119				
Market Street Ry.	100	18,750,000	18,750,000	Q., 60c. per share.		61 1/2	68 1/2				
Presidio & Ferries RR.	100	1,000,000	550,000			16	—				
Scranton Pa.—Feb 25	50	6,000,000	2,500,000			29	30				
Scranton Railway Co.	50	6,000,000	2,500,000			29	30				
Scranton & Carbondale Trac. Co.	100	500,000	500,000			16 1/2	—				
Scranton & Pittston Traction Co.	100	1,050,000	1,050,000			—	—				
Springfield Ill.—Feb 25	100	750,000	750,000			—	—				
Springfield Consolidated Ry.	100	750,000	750,000			—	—				
Springfield O.—Feb 25	100	1,000,000	1,000,000			—	—				
Springfield Street Ry.	100	1,000,000	1,000,000			—	—				
Springfield Mass.—Feb 25	100	1,200,000	1,166,700	1 %	A.	207	212				
Springfield Street Ry.	100	1,200,000	1,166,700	1 %	A.	207	212				
Toronto Canada.—Feb	100	6,000,000	6,000,000	1 %	Q. S.	108 1/2	108 1/2				
Toronto Street Ry.	100	6,000,000	6,000,000	1 %	Q. S.	108 1/2	108 1/2				
Montreal Street Railway Co.	—	4,000,000	4,000,000			272 1/2	265				
Washington, D. C.—Feb 25	50	500,000	500,000			102 1/2	102 1/2				
Belt Ry. Co.	50	500,000	500,000			102 1/2	102 1/2				
Capital Traction Co.	100	12,000,000	12,000,000	55c. per sh. Oct. '98.		102 1/2	102 1/2				
Columbia Ry. Co.	50	400,000	400,000	6 %	A.	85	40				
Washington & Soldiers' Home Ry.	50	707,000	652,000			29	21				
Georgetown & Tenallytown Ry.	50	200,000	200,000			—	—				
Metropolitan RR. Co.	50	1,000,000	458,900	2 %	Q.	—	—				
Worcester, Mass.—Feb 25	100	8,000,000	8,000,000			82 1/4	85				
Worcester Traction Co.—com.	100	8,000,000	8,000,000			82 1/4	85				
Worcester Traction Co.—6 % pfd.	100	2,000,000	2,000,000	8 %	Q. S., Feb.	104	106				
Worcester & Suburban Street Ry.	100	550,000	542,500	4 %	Q. S., 1898.	—	—				
Wilkesbarre, Pa.—Feb 25	100	5,000,000	5,000,000	1 %	Jan.,	25	29				
Wilkesbarre & Wyoming Val Trac.	100	5,000,000	5,000,000	1 %	Jan.,	25	29				

* Unlisted. † Paid in. ‡ Full paid. § Outstanding. ¶ Ex-div.
 a Leased to Hestonville, Man. & Fairmount Passenger Ry. for 6 % on stock per annum.
 b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
 c Practically all shares owned by Union Traction Company.
 d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
 e Leased to Electric Traction Company.
 f Controlled by Frankford & Southwark Passenger Railway.
 g Leased to People's Passenger Railway at 3 % per share.
 h Majority of stock owned by People's Traction Company.
 i Leased to Union Traction Company.
 j Lease transferred to Union Traction Company.
 k Leased to Union Traction Company at a rental of \$10,000 per annum in 1886-7-8, \$20,000 in 1899-1900 and \$30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.
 l Dividend of 10 % guaranteed by Reading Traction Company.
 m Dividend of 6 % guaranteed by Reading Traction Company.
 n Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

Boston, Mass.—Feb 25					115	125
Fort Wayne Electric trust receipts..	25	.....	.....	.....	15	25
Ft. Wayne Elec Co. T. Sec. Series A.	100	40,000,000	80,460,000	2 % Q., Aug., 1898.	218	218 1/2
*General Electric Co. [old] ... com.	100	18,276,000	18,276,000	1 1/2 % Q., Apr., 1900	22	22
General Electric Co. [new] ... com.	100	.....	.....	.....	55 1/2	55 1/2
T.-H. Elec. Co.. T. Secur.. Series C.	50	.....	146,700	.....	69 1/4	70
Westinghouse Elec. & Mfg. Co. com.	50	4,000,000	8,998,058	1 1/2 % Q., Jan.,	44 1/2	45
Westinghouse El. & M/g. Co. pfd.	50	11,000,000	8,195,126	.....	.....	.....
Westinghouse El. & M/g. Co. assent.	50	.....	.....	.....	.....	.....
New York.—Feb 25					119	120
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	.....	.....	.....
*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1 1/2 % Oct., '98.	8	12
Edison Ore Milling Co. com.	100	.....	.....	.....	.....	.....
Electric Vehicle Co. com.	100	.....	.....	.....	.....	.....
General Electric Co. [old] com.	100	40,000,000	80,460,000	2 % Q., Aug., 1898.	23	218 1/2
General Electric Co. [new] com.	100	18,276,000	18,276,000	1 1/2 % Q., Apr., 1900	41	41
Interior Conduit & Insulation Co..	100	1,000,000	1,000,000	.....	110	125
† Kings Co. El. Lt. & P. Co. com.	100	2,500,000	2,500,000	A. & O.	.....	.....
Pittsburg, Pa.—Feb 25					168	172
Allegheny County Light Co. com.	100	500,000	500,000	J. & J.	.....	.....
East End Electric Light Co. com.	50	800,000	800,000	Q.	.....	.....
Philadelphia, Pa.—Feb 25					144	144 1/2
Edison Electric Light Co. com.	100	2,000,000	.....	.....	65	70
*Electric Storage Battery Co. com.	100	8,500,000	.....	.....	65	73
*Electric Storage Battery Co. pfd.	100	5,000,000	.....	.....	18	18 1/2
Northern Elec. Light & Power Co..	10	550,000	550,000	.....	80	.....
Southern Elec. Light & Power Co..	10	187,500	187,500	.....	.....	.....
Miscellaneous.—Feb 25					47	48
Bridgeport (Conn.) Elec. Lt. Co.	25	500,000	.....	.....	20	21
Missouri-Edison (St. Louis) com.	100	.....	.....	.....	9	14
Eddy Electric Mfg. Co. com.	25	.....	.....	.....	175	176
Hartford (Conn.) Elec. Light Co.	100	850,000	.....	.....	6	10
Hartford (Conn.) Lt. & Power Co.	25	175,000	.....	.....	195	.....
New Haven (Conn.) Elec. Lt. Co.	100	100,000	.....	.....	102	101
Narragansett (Prov., R. I.) Elec. Co..	50	1,200,000	.....	2 % Q., Oct.,	118 1/2	120 1/2
Rhode Island Elec. Protec. Co.	100	.....	.....	.....	218	218 1/2
Royal Elec. Co. (Montreal) com.	100	1,225,000	.....	1 1/2 % Q.	183	183 1/2
Toronto (Canada) Elec. Light Co.	100	1,085,000	1,085,000	1 1/2 % Q.	.....	100
Thomson-Houston Welding Co.	100	.....	.....	5 % S, Dec. 1,	105	106
Woonsocket (R. I.) Electric Co.	100	.....	.....	.....	.....	.....

† On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to \$20,827,200, of which \$18,276,000 is common and \$2,551,200 preferred.
 ‡ Ex-div.
 § Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

Boston Mass.—Feb 25	50
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BONDS.

PASSENGER RAILWAY.

NAME.	Amount.					
	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
Albany N. Y.						
Date of Quotation—Feb 25, 1901						
The Albany Ry. Co. Cons. mtg. 5s.	\$500,000	427,500	1940	J. & J.	117½	....
The Albany Ry. Co. Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	116½	....
Watervliet Turnpike & RR. 1st mtg. 6s.	850,000	850,000	1919	M. & N.	112	....
Watervliet Turnpike & RR. 2d mtg. 6s.	150,000	150,000	1919	M. & N.	112	....
Troy City Railway Co. 1st 5s.	....	....	1942	....	114	116½
Interest guar. by Albany Ry. Co. Principal and interest guar. by Albany Ry. Co.						

Baltimore Md.

Date of Quotation—Feb 25, 1901

United Electric Ry. Co. 1st mtg. 4s.	88,000,000	18,000,000	1949	M. & S.	102	102½
..... Income 4s.	14,000,000	....	1949	J. & D.	74½	75
Baltimore City Pass. Ry. 1st mtg. 5s.	2,000,000	2,000,000	1911	M. & N.	118½	....
Baltimore Traction Co. 1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
Baltimore Trac. Co. Exten. & Imp. 6s.	1,250,000	1,250,000	1901	M. & S.	104½	....
Bal. Trac. Co. No. Balto div. 1st mtg. 5s.	1,750,000	1,750,000	1942	J. & D.	121	121½
Bal. Trac. Co. Coll. Trust 1st mtg. 5s.	750,000	....	1900	J. & J.	101	....
Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	102½	....
Central Pass. Ry. Co. 1st mtg. 5s.	96,000	117,000	1912	J. & J.	....	....
Central Pass. Ry. Co. Cons. mtg. 5s.	804,000	880,000	1932	M. & N.	119	121
City & Suburban Ry. 1st mtg. 5s.	8,000,000	8,000,000	1922	J. & D.	116	117
Lake Roland Elev. 1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	....

All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Feb 25, 1901.

Lynn & Boston RR. 1st mtg. 4s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry. Debent. 4s.	8,000,000	....	1902	M. & N.	104½	106
West End Street Ry. Debent. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	....

†\$1,074,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Feb 25, 1901.

Enterprise Street RR. 1st mtg. 5s.	500,000	47,000	1908	J. & J.	....	....
Charleston City Ry. 1st mtg. 6s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Feb 25, 1901.

Chicago City Ry. 1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101½	2½
Chicago Passenger Ry. 1st mtg. 6s.	400,000	400,000	1908	F. & A.	....	102
Chicago Passenger Ry. Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	....	....
Chicago & So. Side R. T. 1st mtg. 6s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T. 2d mtg. 6s.	1,500,000	750,000	1907	J. & J.	....	....
Chicago West Div. Ry. 1st mtg. 4½s.	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR. 1st mtg. 6s.	7,574,000	8,781,200	1928	J. & J.	....	....
Metrop. W. Side Elev. Ry. 1st mtg. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR. 1st mtg. 5s.	8,171,000	8,171,000	1906	J. & J.	106	....
North Chicago St. RR. Cert. indeb. 6s.	500,000	500,000	1911	J. & J.	....	....
North Chicago City Ry. 1st mtg. 6s.	500,000	500,000	1900	J. & J.	....	....
North Chicago City Ry. Consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	....
West Chicago St. RR. 1st mtg. 5s.	4,100,000	8,989,000	1928	M. & N.	....	111
West Chicago St. RR. Debent. 6s.	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR. Cons. mtg. 6s.	12,500,000	6,000,000	1936	....	108½	107
W. Chicago St. RR. Tunnel. 1st mtg. 6s.	1,500,000	1,500,000	1909	F. & A.	....	....
†Redeemable at option on 60 da. notice. †Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee. †Subject to call after Oct. 1, 1899, at 110 and interest. †Assumed by W. Chi. RR. Co., lessee. †Int. guar. by W. Chicago St. RR. Co.						

Cincinnati O.

Date of Quotation—Feb 25, 1901.

Gen. New & Cov. St. Ry. 1st Con. mtg. 6s.	8,000,000	2,500,000	1929	J. & J.	114½	115
St. Adams & Eden Pk In. 1st mtg. 6s.	46,000	46,000	1900	A. & O.	108½	104
St. Adams & Eden Pk In. 1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	....
St. Adams & Eden Pk In. Cons. mtg. 6s.	581,090	581,000	1908	M. & S.	108½	....
So. Cov. & Cin. St. Ry. 1st mtg. 6s.	250,000	250,000	1912	M. & S.	121½	122½
So. Cov. & Cin. St. Ry. 2d mtg. 6s.	400,000	400,000	1932	J. & J.	182½	187

†Assumed by the Cin. St. Ry. Co.
†\$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Feb 25, 1901.

Brooklyn Street RR. Co. 1st mtg. 6s.	600,000	600,000	1908	M. & S.	106½	107
Gen. New & Cov. St. Ry. Cons. mtg. 5s.	8,000,000	2,500,000	1922	J. & J.	118½	114½
Cleveland City Cable Ry. 1st mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½	106
Cleveland Electric Ry. Co. 1st mtg. 6s.	8,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry. 1st mtg. 6s.	1,500,000	1,500,000	1918	M. & N.	....	....
East Cleveland RR. 1st mtg. 6s.	1,000,000	1,000,000	1910	M. & S.	....	107½
Fl. Wayne (Ind.) Elec. Ry. 1st mtg. 6s.	600,000	....	1922	M. & N.	....	....
Lansin (O.) Street Ry. 1st mtg. 6s.	200,000	200,000	1915	J. & J.	....	....
St. Ry. Co., Grand Rapids. 1st mtg. 6s.	600,000	600,000	1912	J. & D.	....	....

†\$1,900,000 in escrow to retire bonds of absorbed companies, marked a.
Interest guar. by Cons. St. Ry. Co.

Detroit Mich.

Date of Quotation—Feb 25, 1901.

Detroit Citizens' St. Ry. 1st mtg. 5s.	7,000,000	8,885,000	1906	A. & O.	....	102½
Fl. Wayne & Belle Isle Ry. 1st mtg. 6s.	400,000	877,000	1902	A. & O.	....	....
The Detroit Ry. 1st mtg. 6s.	1,800,000	1,800,000	1925	J. & D.	106	106½

†\$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Feb 25, 1901.

New Haven St. Ry. 1st mtg. 6s.	600,000	600,000	1918	S	111	....
New Haven (Edgewood Div.) 1st mtg. 5s.	250,000	250,000	1914	J. & D.	111	....
Winchester Avenue RR. 1st mtg. 6s.	100,000	800,000	1912	M. & N.	109	....
Winchester Avenue RR. Debent. 6s.	110,000	24,000	1919	M. & S.	....	....

*With interest. *Unlisted.

PASSENGER RAILWAY.

NAME.	Amount.					
	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
New Orleans La.						
Date of Quotation—Feb 25, 1901.						
Canal & Claiborne RR. cons. mtg. 6s.	\$150,000	\$150,000	1912	M. & N.	....	....
Crescent City RR. 1st mtg. 6s.	....	80,000	1899	M. & N.	105½	....
Crescent City RR. Cons. mtg. 6s.	5,000,000	8,000,000	1948	J. & J.	....	....
New Orleans City RR. 1st mtg. 6s.	416,500	899,000	1908	J. & D.	108	112
N. Or. City & Lake RR. 1st mtg. 6s.	5,000,000	2,599,500	1948	J. & J.	112	118
N. Orleans & Carrollton RR. 2d mtg. 6s.	850,000	850,000	1907	F. & A.	....	....
Orleans Railroad Co. Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	....	....
St. Charles St. RR. Co. 1st mtg. 6s.	800,000	75,000	1906	J. & D.	....	....

†\$423,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
†\$90,000 outstanding.

New York.

Date of Quotation—Feb 25, 1901.

Atlantic Ave. (Brooklyn) Imp. 6s.	1,500,000	1,500,000	1904	J. & J.	95	....
Atlantic Av. (Brooklyn) 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½	110
Atlantic Av. (Brooklyn) Cons. mtg. 5s.	8,000,000	1,968,000	1981	A. & O.	115	116
B'way & 7th Ave. 1st cons. mtg. 6s.	12,500,000	7,650,000	1948	J. & D.	128	126
B'way & 7th Ave. 1st mtg. 6s.	1,500,000	1,500,000	1904	J. & D.	104	105½
Broadway & 7th Ave. 2d mtg. 6s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface. 1st mtg. 6s.	1,125,000	1,125,000	1924	....	115	117
Broadway Surface. 2d mtg. 6s.	1,000,000	1,000,000	1905	....	106	106
Brooklyn City RR. Co. 1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown. 1st mtg. 5s.	2,000,000	2,000,000	1889	J. & J.	115	116
Brooklyn Bath & W. E. RR. Gen. mtg. 6s.	1,000,000	448,000	1888	J. & J.	101	....
Brooklyn Heights RR. 1st mtg. 5s.	250,000	250,000	1941	A. & O.	104	....
Brooklyn, Q's Co. & Sub'n. 1st mtg. 5s.	8,500,000	8,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n. 1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	....
Brooklyn Rapid Transit. gold 5s.	7,000,000	5,181,000	1945	....	109½	109
Bleecker St. & Fulton Ferry RR. 1st mtg. 7s.	700,000	700,000	1900	....	98½	100½
Cent. Pk. N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Croton RR. 1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	....
Coney Island & Brooklyn RR. 1st mtg. 6s.	800,000	800,000	1908	J. & J.	101	108
Ed. Dock, E. Bd'y & Bat'y R. gen. mtg. 6s.	1,000,000	980,000	1932	J. & D.	117	120
Ed. Dock, E. Bd'y & Bat'y R. scrip 5s.	100,000	1,100,000	1914	F. & A.	102	106
Elgin Av. RR. Co. Cert. indeb. 6s.	100,000	1,000,000	1914	F. & A.	108	....
42d St., Man. & St. Nich. Av. 1st mtg. 6s.	200,000	1,200,000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av. 2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	....
Lex. Ave. & Pav. Ferry RR. 1st mtg. 6s.	5,000,000	5,000,000	1938	M. & S.	124	126
Metropolitan St. Ry. Co. g. m. cl. tr. 6s.	12,500,000	19,500,000	1997	F. & A.	120	....
Second Avenue Ry. Gen. cons. mtg. 5s.	1,600,000	1,600,000	1909	M. & N.	120	121
Second Avenue Ry. Deb. 5s.	800,000	800,000	1909	J. & J.	108½	109
Steinway Ry. (L. I.) 1st mtg. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co. 1st mtg. 6s.	850,000	850,000	1911	....	110½	112½
Third Avenue RR. 1st mtg. 6s.	5,000,000	5,000,000	1887	J. & J.	....	128½
Twenty-third Street Ry. 1st mtg. 6s.	....	....	1909	J. & J.	....	....
Twenty-third Street Ry. Deb. 5s.	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry. 1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A.	118	116
Westchester Electric RR. 1st mtg. 5s.	500,000	500,000	1948	J. & J.	110	114

†\$1,085,000 in escrow to retire gen. mtg. bonds.
†\$4,850,000 in escrow to retire maturing obligations.
†\$552,000 in escrow to retire 1st and 2d mtg. bonds.
†In treasury, \$80,000.
†Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Feb 25, 1901.

Montreal St. Ry. 1st mtg. 6s.	2,500,000	800,000	1908	M. & S.	....	....
Toronto St. Ry. 1st mtg. 6s.	4,550,000	2,300,000	1921	M. & S.	....	....

†\$85,000 per m. single track authorized.
\$600,000 in escrow to retire 5s due in 1901.

Philadelphia.

Date of Quotation—Feb 25, 1901.

Empire Pass. Ry.....1st mtg. 7s	800,000	200,000	1900	J. & J.	.....	.....
Greene & Coates St. Ry.....1st mtg. 6s	100,000	100,000	1898	J. & J.	.....	.....
Harb'rd & So. St. Pass. Ry.....1st mtg. 6s	150,000	.....	1901	.....	.....	.....
People's Pass. Ry.....1st mtg. 7s	250,000	250,000	1906	J. & J.	.....	.....
People's Pass. Ry.....2d mtg. 5s	500,000	458,000	1911	J. & J.	.....	.....
People's Pass. Ry.....Cons. mtg. 5s	1,125,000	867,000	1912	M. & S.	.....	.....
People's Pass. Ry.....Stk. trs. cert. g. 4s	5,698,210	.....	1948	.....	.....	.....
Phila. City Passenger Ry.....1st mtg. 5s	800,000	200,000	1910	J. & ..	.....	.....
Philadelphia Trac. Co.....Coll. tr. g. 4s	1,800,000	1,018,000	1917	F. & A.	.....	.....
Rich'th & 15th St. Ry.....1st mtg. 7s	100,000	100,000	1908	A. & O.	.....	.....
Traction Passenger Ry.....1st mtg. 6s	500,000	500,000	1911	A. & O.	.....	.....
Traction Traction Co.....Col. tr. 4s	29,735,000	29,724,876	1945	A. & O.	.....	.....
West End Passenger Ry.....1st mtg. 7s	.....	.....	1905	.....	.....	.....
West Phila. Pass. Ry.....1st mtg. 6s	250,000	246,000	1906	A. & O.	.....	.....
West Phila. Pass. Ry.....2d mtg. 6s	750,000	750,000	1926	M. & N.	.....	.....

The trust certificates were issued to
for the shares of the Electric and
People's Traction lines purchased.

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bld.	Asked.
	Authorized.	Issued.				
St. Lou's.						
Date of Quotation—Feb 25 1901						
Jefferson Avenue Ry.....1st mtg. 5s.	400,000	400,000	1908	M. & N.	108	105
Lindell Ry. Co.....1st mtg. 5s.	1,500,000	1,500,000	1911	F. & A.	108	109
Missouri RR. Co.....1st mtg. 5s.	1,000,000	700,000	1916	M. & S.	105	106
St. Louis & E. St. L. Electric.....1st mtg. 5s.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co.....1st mtg. 5s.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 5s.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 5s.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric.....1st mtg. 5s.	75,000	75,000	1905	J. & J.	100	101
St. Louis & E. St. L. Electric.....1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99%	100%
St. Louis & Sub. Ry.....1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5s.	800,000	800,000	.....	.....	80	84
St. Louis & Sub. Ry.....Cons. mtg. 5s.	500,000	500,000	1909	M. & N.	106	108
Southern Electric Ry.....1st mtg. g. 5s.	500,000	500,000	1918	J. & J.	116	118
Taylor Avenue St. Ry.....1st mtg. g. 5s.	1,091,000	1,091,000	1900	A. & O.	100	100%
Union Depot RR. Co.....1st cons. mtg. 5s.	8,500,000	1,787,000	1918	J. & J.	121	122
Union Depot RR. Co.....Cons. mtg. 5s.	.....	.....	.....	.....	.....	.....
Controlled by St. Louis RR. Co.	.....	.....	.....	.....	.....	.....
Controlled by Union Depot RR. Co.	.....	.....	.....	.....	.....	.....
Controlled by Lindell RR. Co.	.....	.....	.....	.....	.....	.....
\$200,000 in escrow to retire 1st & 2d mtg.	.....	.....	.....	.....	.....	.....
\$800,000 in escrow.	.....	.....	.....	.....	.....	.....
\$200,000 in escrow to retire 1st mtg. bds.	.....	.....	.....	.....	.....	.....
San Francisco Cal.						
Date of Quotation—Feb 25 1901.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
Ferries & Cliff House Ry.....1st mtg. 5s.	650,000	650,000	1914	M. & S.	.....	117
Geary St., Park & Ocean RR.....1st mtg. 5s.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. g. 5s.	8,000,000	8,000,000	1918	J. & J.	126%	.....
Metropolitan Ry. Co.....1st mtg.	200,000	.....	.....	.....	.....	.....
Omni-bus Cable Co.....1st mtg. 5s.	2,000,000	2,000,000	1918	A. & O.	126%	.....
Omni-bus Cable Co.....1st mtg. 5s.	850,000	850,000	1912	J. & J.	105%	107
Park & Cliff House RR.....1st mtg. 5s.	250,000	250,000	1914	J. & J.	115	.....
Park & Ocean RR.....1st mtg. 5s.	700,000	700,000	1912	M. & S.	.....	125
Powell St. Ry.....1st mtg. 5s.	1,000,000	900,000	1918	M. & N.	.....	.....
Sutter St. Ry. Co.....1st mtg. g. 5s.	.....	.....	.....	.....	.....	.....
Controlled by Market St. Ry. Co.	.....	.....	.....	.....	.....	.....
Washington D. C.						
Date of Quotation—Feb 25, 1901						
Belt Ry. Co.....Cons. mtg 5s.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 5s.	500,000	500,000	1914	A. & O.	182	.....
Eckington & Soldiers' Home, 1st mtg. 5s.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 5s.	500,000	500,000	1901	J. & J.	.....	.....
\$50,000 in escrow to retire 1st mtg. bds.	.....	.....	.....	.....	.....	.....
Miscellaneous.						
Date of Quotation—Feb 25, 1901.						
Bridgeport Traction Co.....1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 5s.	5,000,000	3,548,000	1981	F. & A.	118	.....
Chesapeake & Potomac RR.....1st cons. m. 5s.	4,000,000	8,000,000	1988	M. & N.	104	105
Cincinnati St. Ry. (Buffalo).....1st mtg. 5s.	8,000,000	2,866,000	1982	M. & N.	112	118
Columbus (O.) St. Ry.....1st cons. g. 5s.	8,000,000	2,281,000	1982	J. & J.	115	.....
Consolidated Traction (N. J.).....1st mtg. 5s.	15,000,000	18,968,000	1988	J. & D.	111%	111%
Crofton St. Ry. (Colo.).....1st mtg. g. 5s.	2,000,000	572,000	1920	J. & D.	115	115%
Denver City Cable Ry.....1st mtg. g. 5s.	4,000,000	8,800,000	1920	J. & J.	20	.....
Denver Con. Tram'y Co.....Con. m. g. 5s.	4,000,000	922,000	1988	A. & O.	80	85
Louisville (Ky.) Ry.....1st cons. mtg. g. 5s.	6,000,000	4,381,000	1980	J. & J.	119	119%
Minneapolis St. Ry. Co.....1st cons. mtg. g. 5s.	5,000,000	4,050,000	1919	J. & J.	110%	110%
No. Hudson Co. Ry. (N. J.).....Cons. mtg. 5s.	8,000,000	2,878,000	1928	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.).....2d mtg. 5s.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.).....Deb. 5s.	500,000	489,000	1902	F. & A.	.....	.....
Pateron (N. J.) Ry.....Cons. mtg. g. 5s.	1,250,000	1,000,000	1901	J. & D.	.....	.....
Rochester (N. Y.) Ry.....1st mtg. 5s.	8,000,000	2,000,000	1980	A. & O.	.....	.....
St. Paul City Ry.....Cons. g. 5s.	5,500,000	4,298,000	1987	.....	105%	106
St. Paul City Ry.....Deb. g. 5s.	1,000,000	1,000,000	1900	.....	108	.....
\$1,000,000 in escrow to retire 1st and 2d mtg. bds.	.....	.....	.....	.....	.....	.....
\$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.	.....	.....	.....	.....	.....	.....
\$780,000 in escrow to retire bonds of C. St. RR. Co.	.....	.....	.....	.....	.....	.....
\$87,000 in treasury.	.....	.....	.....	.....	.....	.....
\$980,000 res'ed to redeem prior liens.	.....	.....	.....	.....	.....	.....
\$620,000 in escrow.	.....	.....	.....	.....	.....	.....

*With int' res

ELECTRIC LIGHT AND ELECTRICAL MFG. COs

Boston, Mass.						
Date of Quotation—Feb 25 1901.						
Delaware Gas Lt. Co.....1st m. 5s. g.	800,000	800,000	.....	J. & J.	106	108
Edison Elec. Illuminating Co., Boston.....	2,026,000	.....	.....	Quar.	187	.....
General Electric Co. gold coup. deb. 5s.	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa.						
Date of Quotation—Feb 25, 1901						
Allegheny County Light Co.....5s.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Scrip 5s.	196,570	.....	.....	M. & S.	.....	.....
Miscellaneous.—(Feb 25 1901.)						
Edison El. Ilig. Co. (N. York) 1st m. 5s.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilig. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1908	.....	124	.....
Edison Elec. Ilig. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	123%	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	.....	1987	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 5s.	5,175,000	.....	1997	A. & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5s.	8,000,000	.....	.....	F. & A.	103%	.....
United Elec. Light & Power Co. (N. Y.).....	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—Feb 25, 1901.						
American Bell Telephone.....4s.	.....	.....	1908	F. & A.	100%	101
Northwestern Telephone Co.....7s.	.....	.....	.....	.....	111	.....
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 5s.	.....	.....	1911	J. & D.	108	106
Chesapeake & Potomac Teleph. Co.....5s.	.....	.....	.....	.....	.....	.....

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—Feb 25 1901.						
American Electric Heating.....7s.	800,000	500,000	.....	.....	.....	25
Armington & Sims Engine Co.....6s.	.....	.....	1942	J. & J.	106	107
Barray & Smith Car Co.....6s.	.....	.....	1908	J. & D.	.....	.....
Carborundum Mfg Co.....6s.	.....	.....	.....	.....	.....	.....
Washington Pump Co.....(Nominal)	75,000	.....	.....	.....	115	127
Unlisted	.....	.....	.....	.....	.....	.....

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16% @ 16% c.; Lake, 16% @ 17% c.; casting, 16% @ 16% c.

The Cincinnati Traction Company has been chartered, with a capital of \$2,000,000, to lease the Cincinnati Street Railway.

Coupons due March 1, 1901, from the first mortgage five per cent. gold bonds of the United Traction and Electric Company, Providence and Pawtucket issue, will be paid on and after March 1, 1901, on presentation at the office of the Central Trust Company of New York.

Cleveland advices state that the earnings of the National Carbon Company for last year are in the neighborhood of 5 per cent. on the common stock. The recent buying of the stock is said to be speculation on prospect of a dividend. The improvements made on the property last year are said to have been few and only a small amount will be charged off for depreciation.

The Cincinnati street railway system, its franchises, rolling stock and all other rights and equipment have passed into the hands of the Widener-Elkins syndicate.

Chief Engineer Parsons of the Rapid Transit Commission of New York announced Tuesday that the underground railroad will be finished before the expiration of the time granted to Contractor McDonald. The work has been progressing so favorably, Mr. Parsons said, that at the latest by Christmas of 1903 trains will be run from the City Hall to the northern limits of the city.

Traffic on the Metropolitan Elevated Railroad of Chicago thus far this month exceeds that of the corresponding period last year, when the average daily travel was 92,618 passengers. March has always been the heaviest month of the year under normal conditions, and traffic seems growing up to a good showing for that month. Last year, the March showing averaged 94,508 passengers daily.

The stockholders of the Columbus Edison Company are offered the right to subscribe for 6% per cent. of additional preferred stock at par. Payment must be made in an installment of 10 per cent. April 1, 30 per cent. July 1, 30 per cent. September 1 and 30 per cent. November 1. The proceeds of the sale, \$47,000, are to be used in enlarging the company's stations. The rights are to stockholders of record March 1 and expire March 15.

The value of the stock, which the Royal Electric Company, of Montreal, received from the Canadian General Electric Company, of Toronto, for the manufacturing plant of the former company in Montreal, is to-day placed at \$612,000. The transfer of the plant took place some time ago, but the inventory has not yet been definitely decided. Mr. Rodolphe Forget, president of the Royal Electric Company, states that the original amount involved would be about \$480,000.

The annual meeting of the Canadian General Electric Company, of Toronto, Ont., was held on February 20. The report showed that the net profits, on operating accounts, amounted to \$262,903, and the premiums on the new stock to \$75,000. These items, with the \$58,437, balance from last year, make a total of \$396,340. The dividends, 10 per cent. on the common stock and 6 per cent. on the preferred stock, amounted to \$127,623; \$125,000 has been added to the reserve, making that fund now \$365,000, and a further sum of \$12,600 has been placed to the credit of profit and loss, making \$71,038 carried forward.

Chicago newspapers declare that the "deal" between Mr. Yerkes and the Ryan syndicate was closed last Friday in New York and that the individual holdings of Mr. Yerkes in the capital stock of the Lake Street, Northwestern and Union Elevated companies were transferred to new owners. The terms are not obtainable, but \$5,000,000 is regarded as a fair figure for the securities. From the best data at hand, it seems probable that Mr. Yerkes parted with about 25,000 shares each of Lake Street and Union Elevated stock and about 10,000 shares in Northwestern Elevated.

The Queen City Telephone Company was incorporated at Albany, N. Y., on Monday with a capital stock of \$500,000 to operate a telephone system in the city of Buffalo and connecting the following other cities: Easterly to Rochester, Syracuse, Utica, Albany, Poughkeepsie and New York; northeasterly to Tonawanda, Niagara Falls, Lockport, Oswego, Watertown and Ogdensburg; westerly to Dunkirk, Erie, Cleveland, Detroit, Toledo and Chicago, and southerly to Jamestown, Hornellsville, Binghamton, Corning, Elmira, Scranton, Wilkes-Barre, Philadelphia, Jersey City and Washington.

The "New York Daily Stockholder" says: "The report of the Brooklyn Heights Railroad Company, the largest slice of the Brooklyn Rapid Transit outfit, shows that for the December quarter gross earnings of \$2,883,681 were \$28,766, or just about 1 per cent. larger, than a year ago. The company succeeded in keeping expenses down \$77,608 and thus increasing net earnings \$106,374, but how much these indicate improvement in the surplus and foretell of early dividends on Brooklyn Rapid Transit stock may be gathered from the fact that the surplus was \$33,827, and showed an increase of \$16,775. It seems the most of the gain in net earnings was made away with before the last line in the statement could be reached, fixed charges sandbagged it to the extent of \$90,905, and it was helped by only \$1,306 increase in other net income."

At a special meeting in Pittsburg on February 20 of the stockholders of the Westinghouse Electric and Manufacturing Company, it was voted to increase the capital stock by \$10,000,000, designating the new stock as second preferred or as-senting. The present capital stock is \$15,000,000. Of this increase, \$3,000,000 will be issued at once and will be offered to stockholders at not less than par, as the directors may decide. The remaining \$7,000,000 will be issued as necessity demands, at not less than par. At the meeting it was announced that the proceeds of the sale of the \$3,000,000 new stock are to be used for working capital and extensions. The earnings of the company for the year ending March 31, 1900, were approximately \$12,000,000, or \$7,500,000 more than for the year ending March 31, 1899. The surplus account on December 31, 1900, stood at \$4,700,000 after \$2,700,000 had been written off for depreciation.

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EDITORIAL NOTES.

The Berliner Patent.

Elsewhere in this issue
will be found in detail
the account of the Ber-
liner patent decision as
handed down in Boston on February 27 by Judge
Brown, in the suit of the American Bell Tele-
phone Company vs. the National Telephone
Manufacturing Company. The patent over
which the suit was fought was issued to Emile
Berliner on November 17, 1891, after the lapse
of fourteen years, five months and thirteen
days from the date of the application. The
whole explanation of this was that the Bell
Company delayed the taking out of this pat-
ent until a time best suited to its interests. As
the original Bell patents covering the receiver
were to expire on March 7, 1893, the Bell Com-
pany caused the Berliner patent in question to
be issued, with a view to securing a monopoly
of the business for an additional period of
fifteen years.

This action as is well known led to a consid-
erable amount of litigation some years ago be-
tween the United States and the Bell Com-
pany, in which it was decided that the Ber-
liner patents were valid. The patents were
sufficiently broad to cover all telephones in
commercial use, and through them the Bell
Company claimed exclusive right to manufac-
ture all forms of contact transmitters and
microphone receivers. If this claim had been
sustained by Judge Brown, it would be impos-
sible for any other concern to manufacture or
use the commercial telephone as it is to-day.
This would have meant the downfall of the
independent telephone movement, which has
done so much to lower rates and furnish good
service through healthy competition.

The American Bell Telephone Company has
made a vigorous fight to gain its end, and as
a natural result the decision in favor of the
independent company, is regarded by officials
of the monopoly as a severe blow.

Now the field is open to any company that
may desire to use the microphone. There is no
doubt but that the American Bell Telephone
Company will take the case to the United
States Supreme Court, but independent tele-
phone company officials feel so confident that
Judge Brown's decision will there be upheld,
that they intend proceeding on those lines.
The decision furthermore cannot help but
strengthen the independent movement, as

capital that has heretofore been withheld from
investment in telephone enterprises, owing to
the uncertainty of the validity of the Ber-
liner patent, will now unquestionably be forth-
coming. Referring to the decision rendered
W. H. Eckert, president of the Knickerbocker
Telephone and Telegraph Company, is reported
as saying:

"This decision rendered by Judge Brown,
in which he declares the Berliner transmitter
patent void, will be far reaching in its effects.
It has been the plan of the American Bell
Telephone Company and its licensed com-
panies to give the impression that the life of
independent telephone companies would be
short in view of the Berliner patent. Of
course the Bell telephone interests have made
strenuous efforts to forestall competition.
These efforts have, in many cases, been so
successful that difficulty has been experienced
in financing new telephone enterprises.

"In the middle West, however, the inde-
pendents have proceeded regardless of the
fate of the Berliner patent, but in the East,
where Bell Telephone securities are princi-
pally held, independent telephone enterprises
have not been so numerous as in the middle
West. In view of this there can be no doubt
whatever that the decision of Judge Brown
will remove all distrust on the part of pros-
pective investors and users of independent
telephones.

"This decision in the Berliner case will give
impetus to the Knickerbocker Telephone and
Telegraph Company. Although this company
has been constructing its plant for some little
time, there is no doubt but that its construc-
tion will proceed with renewed vigor from this
time on. It is hoped that the subscribers to
the system of the Knickerbocker Company
will be of such numbers as to compare favor-
ably with the independent telephone situa-
tion in other localities.

"In Ohio, for instance, although there is no
independent telephone system in Cincinnati,
Toledo and Dayton, there are far more subscrib-
ers to the independent telephone companies
in that State than to the Bell system. The
same is the case in other States, and we
hope that a like condition of affairs will be
found in New York City and other important
points in the East in the near future. In a
word, the independent telephone situation has
been wonderfully improved by Judge Brown's
decision."

That the decision recently rendered is a just

one will be apparent to anyone who has studied the matter carefully. The independent companies have just cause for rejoicing, and it is to be hoped that through the untiring efforts of such men as Judge Thomas, G. W. Beers and others the independent movement may grow to mammoth proportions during the next year or two.

* * *

A Proposed Method of Voting by Electricity.

It seems not unlikely that within a comparatively short space of time electricity will play an important part in the accomplishment of National legislation. A movement is now on foot to have designed and placed in the House of Representatives at Washington a device enabling Representatives to vote and have their votes recorded, counted and displayed through the agency of the electric current.

Such a device would not only insure absolute accuracy but save a vast amount of time, which is money in this particular instance. Every time a roll call is demanded and proceeded with in the House it costs the people of the United States approximately \$4,000 during a short session of Congress. The gross expense of maintaining the House of Representatives is about \$3,000,000 per annum. Counting one hundred days in a short session (there are actually but ninety) the expense amounts to \$30,000 per day of not more than five hours length, or \$6,000 per hour. The time consumed in a roll call is about forty-five minutes. It is estimated that but three minutes' time would be required to call the roll under the proposed electrical system, a net saving of at least forty minutes' time.

During the early part of the recent session a bill was introduced in the House by Representative Otey for the erection of the electrical device or appliance in the rear of the Speaker's desk and facing the main entrance, to be connected with each member's desk, so that he would be enabled to touch a button and show the record of his vote by a small incandescent light. After the presentation of the bill Mr. Otey laid the matter before the acting architect of the Capitol, Mr. Elliott Woods, in order to obtain from him suggestions as to what would be the best method of attaining the desired end, namely, saving of time, over the present method of recording a vote. Mr. Woods calls attention to what he considers to be three essential features to make such a device a working success: first, the names of the members should be visible from every part of the House, as well as their vote; second, there should be a duplicate device placed in such a position that it would be in front of the tally clerk; third, the device should be so arranged that it would place upon record on paper the result of the vote, so that it could become a part of the Record.

It is suggested that the principal device should consist of a large board, placed so that it would be well above the Speaker and in full view of the members, this board to be so divided that there will be an equal number of spaces as there are members; the name of the member to be shown in black on white porcelain glass. At the right of the name would be two small spaces, one to register the "aye" and the other the "nay" vote. The duplicate would be a miniature representation of the first and could be placed under a sheet of plate

glass in the top of the tally clerk's desk. At the right of this tally device would be arranged an automatic punching and adding machine to record the vote.

The other end of the device would be a set of two buttons, to be placed in each member's desk, to record the vote, and a third button and a corresponding space are suggested in order that there might be a record of "present, not voting." As a separate wire would run from each member's desk to the three boards, the vote of the entire House might be made instantaneously provided each member pressed his button at the same moment.

To perfect such a device would take some time, as it is entirely new in idea, and would require original work along untried lines, always more expensive than any work on established principles. It is thought that the cost might be anywhere from \$10,000 to \$15,000. It is suggested that such a device would completely revolutionize methods of procedure in the House.

* * *

High Speed Electric Roads for Germany.

Efforts have been and are constantly being made to increase the rate of speed of travel. Twenty years ago a steam locomotive that could reel off fifty miles an hour was considered a wonder, while now we have engines that run sixty and even seventy miles an hour without anything being thought of it. But with the present form of steam locomotive the limit of speed would seem to have been reached, and for this reason inventors and engineers have turned their attention to electricity as the propelling power. In the near past various forms of high speed electric railways have been suggested, probably the most practicable being that designed by Mr. Behr in England, and referred to at various times in these columns. Germany would now seem to be examining into this matter, and in a recent communication to the State Department, Mr. Guenther, United States Consul General in Frankfurt, refers to the subject at considerable length. It is Germany's ambition, so it seems, to be first in the field with the ideal railway of the future. At a recent audience in Berlin Privy Councillor Rathenau, a promoter of great electrical enterprises, gave Emperor William considerable information, and especially emphasized the necessity of constructing electrical railways for direct and rapid connection between Berlin and the principal cities of the empire. He also brought out the fact that a great national triumph would be gained if Germany could be the leader in the creation of an entire electrical railway system.

The German Secretary of War has placed the military line from Berlin to Zossen at the disposal of electrical promoters, who are urging upon the Government this mode of travel for experimental purposes. This line is 18 miles in length, and it is hoped that a speed of from 125 to 155 miles an hour can be attained. The cars will each accommodate fifty passengers, and will look very much like the sleeping cars now in use. If the trial runs prove satisfactory a great step toward the utilization of electricity as the sole railway motive power will have been gained, and, says the Consul General "the time will not be distant when it will be possible to travel, for example, from Berlin to Hamburg in a little over an hour, in

cars which will follow each other at intervals of ten minutes."

The day will no doubt come when persons can be transported from one point to another at the rate of 150 miles an hour, but we think our German friends are a little too optimistic and that the speed talked of is not yet in sight.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

A DISPATCH from Schenectady says that J. P. Ord has resigned the second vice-presidency of the General Electric Company for the purpose, it is understood, of becoming the head financial man of the United States Steel Corporation.

THE inventory of the estate of Bernard M. Shanley, the trolley magnate, who died last March, filed with Surrogate Eller of Newark, N. J., shows a total valuation of nearly \$7,000,000.

AN American company has negotiated the purchase of the Manila Street Railway, which it proposes to convert to the electric system.

A YOUNG inventor of Bridgeport, Conn., has recently patented a new fuse box which, it is claimed, will prevent exposed charged wires from igniting inflammable material, with which they might come in contact, and will also prevent the breaking of a circuit by the burning out of a fuse box by overcharged wires.

A BILL has been introduced in the Illinois Legislature to abolish hanging and establishing electrical execution as the legal mode of inflicting the death penalty.

ACCORDING to a daily paper one million dollars is to be expended in a system of sanitariums for the cure of consumption, by electricity and Cleveland, O., men will see the project through in a financial way. The sanitariums are to be placed in some of the largest cities in the United States and Canada.

THE Shah of Persia had an agent in this country a short time ago making an investigation of our trolley lines, and it is now stated that an electric line is to be run for about a hundred miles from Teheran to a port on the Caspian Sea.

THE White Star Line within a few weeks will replace the steam winches for hoisting cargo and gang planks on its piers with electric windlasses. Bruce Ismay, the head of the company, recently signed a contract for the installation of the electric plant. It is said that other lines will follow the example of the White Star.

THE State Department at Washington has been informed by Consul Fee at Bombay in a recent report that a steamer, plying directly from New York City, has arrived with an electric plant and outfit and party of engineers and electricians. The party represents a New York firm, and is destined for the Kolar Gold Fields, near Bangalore, the capital of the native State of Mysore. The power necessary to operate this electric plant is to be furnished by the Cauvery River, which will be conducted across the country to the gold fields.

The erection of this plant will, it is expected, increase the production of the mines and reduce the expense of working. It is a new feature in gold mining in India.

THE Automobile Club of New England recently opened new quarters in Brookline, Mass. There were electric, gasoline and steam vehicles, making altogether as fine a collection as could be shown by any American automobile club. The arrangement of the stables was left to Messrs. Knight, Nefell and Howard, and they already have in place a generator for the recharging of electrical machines, and a special arrangement for the refilling of the boilers of steam vehicles.

ACCORDING to the "Electrical Engineer," London, the Allgemeine Elektrizitäts-Gesellschaft has introduced a new meter for recording the number of hours during which a lamp or group of lamps connected to either of its circuits may burn. The meter is intended for use principally in connection with small installations, where the provision of a watt-hour meter would be relatively extravagant. The meter is constructed for three or five circuits, the recording systems in connection with which are served by clockwork in such a manner that the time during which a circuit may be switched in is recorded independently. The central system of clockwork common to the several recorders is arranged to work at a certain uniform speed for a total of 250 hours. This clockwork actuates a driving wheel, with which are arranged concentrically the wheels connecting the respective circuit recorders. The action of switching in a circuit serves at the same time to couple up its respective recording system with the common driving wheel. When all the circuits are switched out the clockwork stops automatically, but the switching in of a single lamp or circuit suffices to again set it in motion, and simultaneously the recorder belonging to the circuit.

THE first sheets of the Pan-American Exposition stamps, which the Bureau of Engraving and Printing at Washington, D.C., has been at work on for the past four months, have recently been finished. They are of the value of two cents, and bear the picture of a railroad train. The design in the one-cent stamp will show a steamer representing lake navigation; the four-cent stamp will show an automobile in the foreground with the Capitol at Washington in the background; the five-cent stamp will contain in its center a picture of Niagara Falls; the eight-cent stamp a picture of the great canal locks at Sault Ste. Marie, while the ten-cent stamp will show an ocean liner. The center design in all the stamps will be in black ink, while the border will be the color of the current series of stamps, and bear the inscription, "Commemorative Series, 1901." The pictures are one-third by one-half an inch in size.

A SUCCESSFUL test of a printing telegraph machine, was recently made on a loop line between Omaha and Kansas City, representing 434 miles of wire, added to which was resistance representing 120 miles of wire, making a total of 554 miles. The sender of the apparatus resembles the keyboard of a typewriter. As the operator manipulates the keyboard the message is transmitted and automatically printed on a roll of paper by the receiver. Any person who can operate a typewriter is capable of

sending a message. The receiving is automatic, the only attention required being to supply rolls of paper when needed and keep the receiver in working order. Each letter is made by a certain motion of one of nine fingers, each finger being susceptible to four motions from as many grades of current, supplied by storage batteries at either end of the line. Thus 36 separate motions are obtained, one for each letter of the alphabet, eight for the figures not contained in the letters of the alphabet, one for the period and one for the spacing. In the test made, an electromotive force of 24 volts was used at first, but was increased to 85 volts when messages were sent at full speed.

Scientists and physicians throughout Europe are interested in a discovery made by Dr. Ottolenghi, Professor of Medical Jurisprudence at the University of Siena. While experimenting with Roentgen rays Dr. Ottolenghi thought that it might be possible to use them effectively for the purpose of ascertaining whether a person was actually dead or simply in a trance, and he at once determined to make the test. He discovered that while it was easy to apply the rays to the lungs of a person who was alive or in a trance it was extremely difficult—indeed, practically impossible—to apply them to the lungs of a person actually dead. The reason was that some intervening obstacle prevented the rays from penetrating into the body. Over and over again he made a test of this kind and in each case the result was the same. He suggests that as this test can easily be made by any physician it should in future be employed in all cases where doubt exists of death.

AMERICAN STREET RAILWAY ASSOCIATION.

All Arrangements Perfected for Holding the Annual Meeting in New York.

The Executive Committee of the American Street Railway Association met at the Murray Hill Hotel, New York, on February 28, to make arrangements for the twentieth annual meeting of the Association, which will be held in New York City. The following named members were present: President Walton H. Holmes, Kansas City; H. H. Vreeland, New York; N. H. Heft, Meriden; John B. McClary, Birmingham, Ala.; Frank L. Fuller, Philadelphia; G. W. Baumhoff, St. Louis; John R. Graham, Boston, and T. C. Penington, Chicago. It was decided to hold the meeting on Wednesday, Thursday and Friday, October 9, 10 and 11. There will be two sessions of the Convention on each of the first two days, and the last day will be set aside for the inspection of exhibits. The banquet will be held in the evening of the last day, when the newly-elected officers will be installed.

The Madison Square Garden has been leased from October 6 to 13, and it is expected that the exhibit of street railway appliances will be on a very large scale. The meetings of the Association will be held in the same building. Provision has also been made for the meetings at the same time of the Street Railway Accountants' Association of America. The usual charge of ten cents per square foot for space in the exhibit hall will be made.

A new departure has been determined upon in the matter of papers presented to the meeting. They are to be printed and advance

copies sent to the members. They will be read at the meeting by title only. The President was authorized to select a speaker to open the discussion on each paper, and thirty minutes will be given to the consideration of each paper.

The following topics were selected, upon which papers are to be presented:

"Street Railways—A Review of the Past and a Forecast of the Future."

"The Adoption of Electric Signals on Suburban and Interurban Railways, Single or Double Track, and Their Economy of Operation."

"The Value of Storage Batteries as Auxiliaries to Power Plants."

"The Public, the Operator and the Company."

"The Best Manner and Mode of Conducting the Return Circuit to the Power House."

"The American Street Railway Association—The Purposes of its Organization and the Benefits Accruing to Investors in, and Operators of, Street Railway Properties by Membership Therein."

"The Economies Resulting from the Use of Four Motors Instead of Two on Double Motor Equipments."

"The Best Form of Car for City Service—A Consideration of the Various Types of Car as to Size of Car and Arrangement of Seats, Including the Best Types of Brakes and Wheels."

"Practical Results Obtained from Three-Phase Transmission and Rotary Transformers or Motor Generators in Transmitting Power on Railway Lines."

"Relations of Interurban and City Railways."

"The Modern Power House, Including the Use of Cooling Towers for Condensing Purposes."

The admission fee will be waived in the case of any company becoming a member of the Association prior to October 1 next, provided the annual dues to October next be paid at the time the application for membership is made.

The President appointed the following named gentlemen as a committee of five on Standardizing of Street Railway Equipment: J. R. Graham, Boston; N. H. Heft, Meriden; F. G. Jones, Memphis; W. J. Hield, Minneapolis, and C. F. Holmes, Kansas City. The Committee was authorized to incur an expenditure not to exceed \$1,000.

The President also appointed the following named gentlemen as a committee of three to report at the next Convention on the subject of transporting the mail and mail carriers on street railway cars: C. S. Sergeant, Boston; C. L. Rossiter, Brooklyn; J. B. Parsons, Philadelphia.

It is confidently expected that the forthcoming meeting will be the most largely attended and of greater value from a practical standpoint than any that have been held.

The Executive Committee was most pleasantly entertained by President Vreeland, of the Metropolitan Street Railway Company, during the stay of its members in the city.

The Standard Underground Cable Company beg to inform the public that hereafter the headquarters of its northeastern sales department will be located in the Tremont Building, Tremont and Beacon streets, Boston, Mass., and requests that communications for the company be addressed to those offices, where they will receive immediate and careful attention.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 17.

INCANDESCENT LIGHTING.

Illumination by the use of the electric current would never have achieved the popularity and success which it at present enjoys had it been confined to the arc lamp. As a matter of fact, the arc light in the earlier days of its history did considerable to render electric lighting unpopular. At the time of its introduction it was just the opposite extreme to what the people had been used to, and on account of the vast difference between the degree of light produced by it and the light produced by candles, oil lamps or a low grade of illuminating gas, the people became very prejudiced against its use except for street or park purposes.

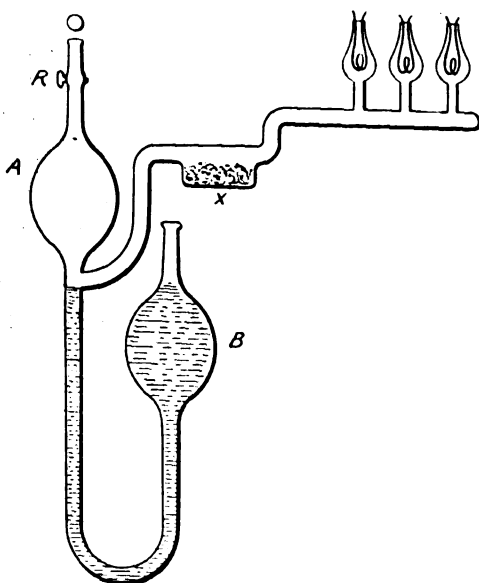


FIG. 1.

The opinion prevailed that the intense brilliancy was hurtful and injurious to the eyes, and that so glaring a light could never displace the soft, mellow glow of gas or candles to which they were accustomed, and that unless some form of electric lamp could be devised to satisfactorily replace these, and be conveniently introduced into houses, electricity would never be adopted.

This acted as an incentive to the inventors and scientists to work with the object of producing an electric light which would solve the difficulty, and as a result we have to-day the incandescent lamp. To a certain extent the experiments with the incandescent lamp were dependent upon another scientific discovery, which was the development of the mercury pump for producing a vacuum. This enabled the production of the lamps to be brought to a successful conclusion.

When first introduced on the market the incandescent lamp was very expensive, which was a retarding feature for a while to its general adoption, but as a result of competition of manufacturers and improved methods and machinery for its production, the price has been greatly reduced and has made it the popular illuminating medium that it is to-day.

The first experiments with the incandescent

lamp were by using wire for the filament, but not a great deal of success was attained in that direction. The only conducting material that would stand the high temperature of incandescence was found to be carbon. Carbon burns away when subjected to a large temperature and exposed to the air. In a globe from which the air has been exhausted carbon will not be consumed however, as there will be no combustion when oxygen does not exist.

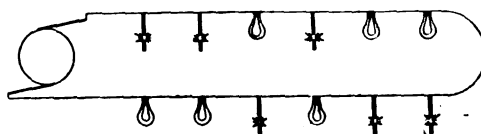


FIG. 2.

The filaments used for the lamps are made of bamboo strips, or from cotton or silk threads carbonized. In their construction the material is first made into the proper size to produce a filament. After being subjected to a certain treatment the threads or strips are bent around "forming blocks" of carbon and packed in a crucible filled with powdered carbon. They are then subjected to a baking process of many hours until they are perfectly carbonized.

After this the filaments undergo another treatment whereby very fine, hard, powdered carbon is deposited upon their surfaces.

This is done to make them withstand the strain of a high temperature.

The ends of a filament are then secured, by means of a suitable cement, to two short pieces of platinum wire which are sealed in the glass and used as conductors through the glass bulb for the current. The air is then exhausted from the bulb by means of a vacuum pump, after which it is sealed at the point where the tube from the pump connects with it.

Fig. 1 illustrates a vacuum pump, involving the principle whereby the air is exhausted from the lamp, and is the one generally used, except probably in a modified form.

This is substantially an air pump made of glass in which mercury is used as a plunger in order that there may be no chance for a leakage of air.

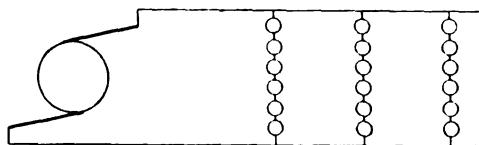


FIG. 3.

A and B represent two glass bulbs which are connected by a glass tube forming a U-shape. Just below A a tap leads off to the lamps to be exhausted. This tap may lead through a chamber X containing some material intended to absorb any moisture which may exist in the air that passes through it. This is necessary, as it is essential that the pump be kept perfectly dry. By means of a suction at the point O the mercury is caused to rise in the bulb A from which the air will be expelled. Then by closing the tap R and drawing the mercury back into bulb B, a vacuum will be established in bulb A and will draw a new portion of air from the lamps. This operation is continued until all the air is practically exhausted from the lamps, after which they are melted or sealed off, where they are connected to the tube. This sealing off process leaves the sharp tip which is noticeable on the end of a lamp.

The operation of the current in an incandescent lamp is simply the energy of the current

overcoming the resistance offered to it by the carbon filament producing heat. The amount of current flowing will of course be governed by Ohm's Law, whereas the pressure of the current divided by the resistance of the filament will equal the current flowing.

Series incandescent lighting is sometimes indulged in for street lighting in a manner similar to a circuit for arc lamps. Lamps are also manufactured to be used on an arc circuit and connected in series, as in Fig. 2.

They are made with larger filaments intended to reach their rated candle power when using the entire amount of current flowing in the circuit. This is not at all an economical method and is only indulged in, to any extent, in small towns where arc machines are operated and some incandescent lamps may be required but not enough to admit of the installation of an incandescent machine. This system however at the present day has become almost obsolete.

Another form of series incandescent lighting is where a number of lamps are placed in series across a multiple circuit of high voltage, as for instance the lamps used in electric street cars. As the voltage on such a circuit ranges generally from 500 to 550 the lamps may be five 110 volt ones connected in series, illustrated by Fig. 3.

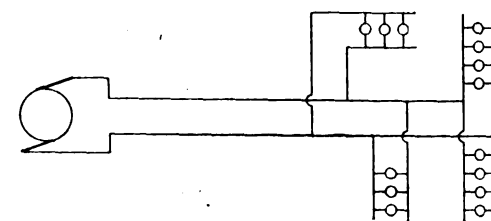


FIG. 4.

This would permit of the proper amount of current to be flowing in each lamp, as it would require 550 volts to force an ampere over five 110 cp. 110 volt lamps connected in series. This might be properly termed multiple-series lighting, as the placing of lamps would consist of series of five each connected in multiple across the circuit.

Of course the generally adopted and most universal method of incandescent lighting is the multiple system, as shown in Fig. 4.

This is simply that the voltage of the supply circuit is the same as that required for the proper operation of the lamps individually, and wherein each and every lamp is connected directly across the circuit, and is entirely independent of any or all other lamps on the circuit.

The aim in this should be to have the circuits so arranged that a uniform and equal electrical pressure will exist at all points where lamps are connected.

This is essential to securing satisfaction and long life of the lamps.

The following figures give a good illustration of the great advantages derived from electric lighting over other methods:

TABLE SHOWING THE ADVANTAGES TO BE DERIVED BY THE USE OF ELECTRIC LIGHT.

Light-producing material equal to 12 standard candles.	Cubic feet of oxygen consumed.	Cubic feet of air consumed.	Cubic feet of carbonic acid produced.
Common gas.....	5.45	17.25	8.21
Sperm oil.....	4.75	23.75	3.98
Paraffin.....	6.81	34.5	4.50
Wax candles.....	8.41	42.05	5.03
Tallow candles.....	12.00	60.00	8.78
Electric light.....	None	None	None

Article No. 18 will be entitled "Hints for the Dynamo Tender."

TESTING CELLS AND BATTERIES IN THE BRITISH NAVY.*

There are two classes of cells used in the navy; one kind possesses a very high internal resistance and is used for testing, while the other kind is for use in performing some kind of work.

The single test cell is a Minotto or modified form of Daniell, consisting of a cylindrical vulcanite container, in the bottom of which is placed a copper cup containing crystals of sulphate of copper.

A piece of thick flannel or "fearnought" is placed on top of this, then a thick layer of fine sawdust, another disk of fearnought, and on this a zinc slab. An insulated wire passes up from the copper cup and forms the positive pole. The negative pole is formed by a wire leading from the zinc.

The container is closed by a vulcanite top through which both wires lead, the positive to

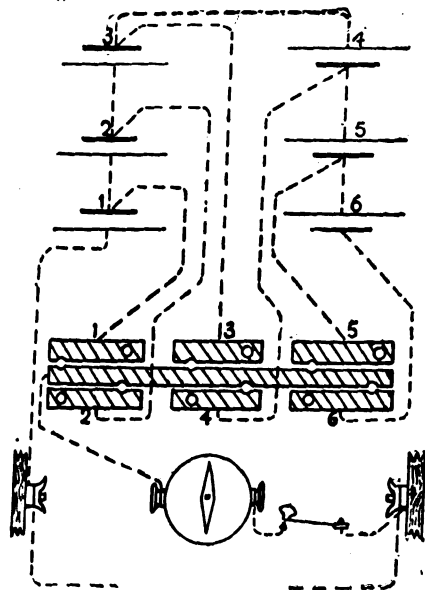


DIAGRAM OF CONNECTIONS.

a terminal and the negative to a small brass nipple.

The rest of the space on top of the battery is taken up by a galvanometer with a resistance of 20 ohms. One terminal of the galvanometer is free, and the other is connected to a key or spring of brass, which forms contact with the nipple of the negative pole on pressure being applied by the finger.

The battery as supplied may be stowed away until required for use; the sawdust being dry, no action takes place.

When required for service the fearnought and sawdust are soaked in fresh water, and the battery is put on short circuit for half an hour. The battery is then ready for use.

When the galvanometer is set so that the pointer is at zero, upon the key being pressed there should be a steady deflection of 80 on short circuit. The whole instrument is enclosed in a leather case with a strap for convenience in carrying; a magnet is also supplied in a pocket on the leather case, for the purpose of steadying the pointer on the galvanometer. This single cell test battery is good enough for all ordinary tests.

The six-cell test battery consists of six Minotto cells, contained in a wooden box. Besides having a hinged top, the front of the box opens outward and forms a tray, upon which is fixed a 1,000 ohm galvanometer, a spring key and

*From the "Electrical Review," London.

the main terminals. It is customary in the navy to work always from the negative pole, connecting the positive pole direct to earth.

The system of brass blocks, which is fixed on to the partition that keeps the battery in place, consists of one long strip of brass, having on either side of it three smaller strips, each of which is connected to the negative pole of its own cell.

The long strip is connected with the galvanometer, and the negative pole of any cell can be brought into connection with it by means of a brass plug, thus putting from one to six cells into the circuit (see diagram).

III.—POLYPHASE ELECTRIC RAILWAYS IN EUROPE.

BY FRANK C. PERKINS.

The Jungfrau Three-Phase Railway.

At the Jungfrau installation two generating stations will ultimately be used with a total capacity of 5,000 horse power. The first power house to be constructed was that at Lauterbrunnen, on the White Lutschine. This station is now in operation and supplies more than 2,000 horse power, while the power house, to be known as the Burglauen station, will

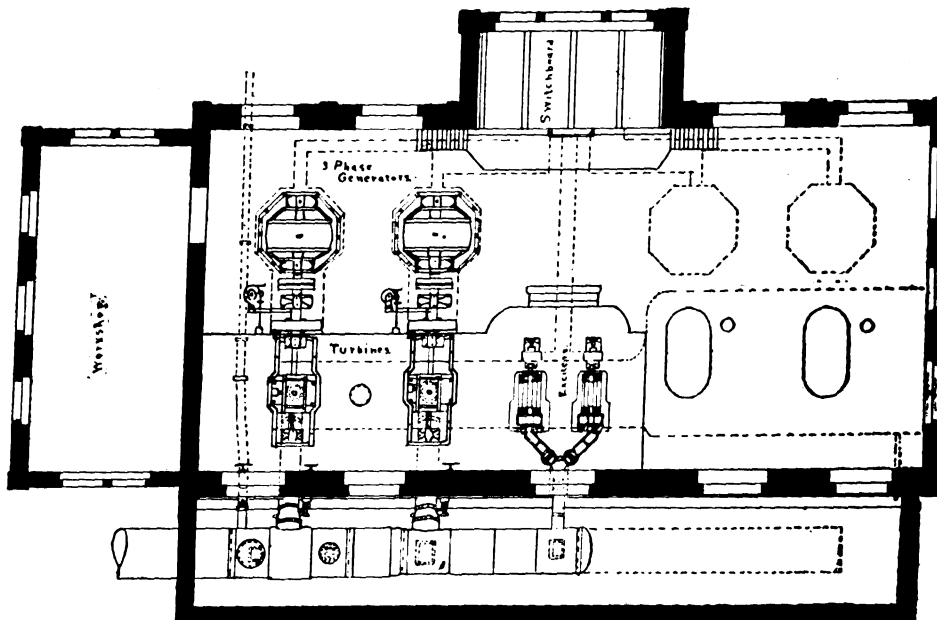


FIG. 1.—PLAN OF POWER HOUSE OF THE JUNGFRAU ELECTRIC RAILWAY.

The cells used in this battery are considerably smaller than in the "single-cell test battery," and are of an oblong shape, for better storage purposes. The galvanometer is astatic, and consequently far more sensitive than in the 20-ohm pattern. Before use the battery itself is invariably tested, to see that each cell is in good condition, by connecting the galvanometer direct to each cell in turn.

The six-cell test battery is used for testing where a high insulation has to be measured, or where the resistance is large as in cables of great length. A simpler battery, in which a circular switch takes the place of the plug and brass strips, is now coming into use.

The test cells being of the Daniell class they are, of course, very constant, and their internal resistance is so high that their current can be passed through any fuse to test it without the slightest chance of firing it.

Chance for American Manufacturers.

Consul Marshal Halstead, of Birmingham, Eng., notifies the State Department that he has been requested to announce that an English electric-supply company wishes to open up correspondence with American manufacturers of electrical accessories. Further information may be had by applying to the Consul reporting.

After several unsuccessful trials with a hot water motor for propelling trains through the New York Central tunnel, leading out of the city, the engineers of the road have decided to make use of the third-rail electric system similar to that recently adopted by the Baltimore & Ohio Railroad.

be located near Grindelwald on the Black Lutschine. The water is supplied to the present Lauterbrunnen station from the White Lutschine through a steel pipe 1.8 meters or about 6 feet internal diameter and nearly half a mile in length. This first section is built up of lengths of about 20 feet and 5 millimeters thick, while a second section of nearly the same length is constructed of steel 7 millimeters in thickness and in lengths about 25 feet each.

The water is supplied to the turbines under a head of 125 feet. The turbines are of the twin Gerard design and were manufactured by J. J. Rieter & Co. There are six turbines in all, three of 500 horse power each and one of 800 horse power, directly connected to Oerlikon polyphase alternators, as shown in plan, Fig 1.

These alternators operate at a speed of 380 revolutions per minute and supply a current having a frequency of 38 periods per second.

These direct-connected three-phase generators have stationary armatures and stationary field coils, as they are of the inductor type. They are high potential machines, generating a current at 7,000 volts pressure.

Two exciter turbines of 25 horse power each are used for operating two direct current dynamos supplying a current of 150 amperes at 120 volts.

The total length of the transmission line from Lauterbrunnen to the Jungfrau is nearly 20 miles. A drop of 700 volts is allowed for the total loss on the line. There are three conductors of about 8 millimeters in diameter mounted on large triple petticoat porcelain insulators. The distance from the power house to the first sub-station at Scheidegg is nearly four

miles, and this transformer station is located on a level nearly one mile higher than the power house.

The Scheidegg sub-station is supplied with two transformers of 200 kilowatts capacity, and the sub-stations at Elgergletscher, Garge, Elsmeer, Jungfrau, Joch and Jungfrau Kulm, are

various parts of locomotives partly assembled. The driving axles are arranged with rack pinions of aluminum bronze and brake wheels and blocks are provided, as will be noted in illustrations.

Sliding contacts on trolley poles take the place of trolley wheels. The speed attained is

moves two toothed pinions working in racks on the sides of the shaft.

This complete mountain electric system will be watched with great interest, as the problem of railway operation by polyphase currents is in a fair way to be satisfactorily solved.

ACIDS FOR FILLING ELECTRIC ACCUMULATORS.

BY RUDOLF HEINZ.

Translated for *ELECTRICITY* from "Centralblatt für Accumulatoren-und Elementenkunde," Berlin.

The durability and efficiency of electric accumulators depend to a large extent upon the sulphuric acid or so-called filling acid used in them and its importance is not generally recognized. The acid ought to be quite clear and have no impurities of any kind, but as absolute purity cannot possibly be guaranteed, manufacturers of accumulators have fixed a maximum figure for the admissible injurious impurities, which sulphuric acid may be allowed to contain and still be considered serviceable for filling accumulators.

Apart from its specific weight, the acid must be quite free from metals, especially those of the hydrothionic group, with the exception of lead. It may contain at the most the following metals of the sulphide of ammonia group: 0.01 per cent. of iron; of chlorine 0.002 per cent. and of nitrogen in the form of ammoniac, nitric acid, nitrous acid and others, no more than 0.1 per cent., always reckoned as hydrated sulphuric acid. It should be entirely free from all organic substances, and as far as possible it should also be free from hydrothionic acid.

Supply houses that fill orders for accumulator filling acid are generally bound to observe the foregoing limits of purity, and they have



FIG. 2.—ENTRANCE TO TUNNEL OF JUNGFRAU ELECTRIC RAILWAY, SHOWING 7,000 VOLT TRANSMISSION LINE.

similarly supplied with three-phase step-down static transformers, whose office it is to reduce the potential from 7,000 volts used on the line to 550 volts used in the trolley feeders. There are twelve sub-stations designed for the entire line, ranging from 2,000 meters to 4,000 meters above the sea level, and at distances from 6,000 feet to 40,000 feet from the first sub-station at Scheidegg.

The tunnels, which are about seven miles in length, cost nearly \$1,000,000. The entrance to the tunnel under construction is noted in illustration, Fig. 2.

At the gallery entrance transformers of 400 kilowatts capacity have been provided for supplying three-phase currents for operating the rotary and percussion drills. These drilling machines are seen in operation in the view, Fig. 3. The stations are lighted and heated by electric radiators and hundreds of 16 cp. incandescent lamps. The lighting of the tunnel is also met by arranging these lamps continuously from 80 to 90 feet apart. The polyphase locomotives used on the Jungfrau line in various stages of construction are shown in Figs. 4 and 5.

The Oerlikon Company was extremely courteous in supplying photographs and data illustrated in this article.

The first locomotives built for this line were supplied by Brown, Boveri & Cie of Winterthur. Two motors of 150 horse power each are used on each locomotive, the normal speed being 760 revolutions a minute.

A number of Oerlikon polyphase locomotives are in operation and are each equipped with two 200 hp. three-phase motors having a normal speed of 500 revolutions per minute. The details of construction are indicated on the

from 8 to 9 miles per hour while the maximum gradient is 25 per cent. The summit is reached without the electric railway in two

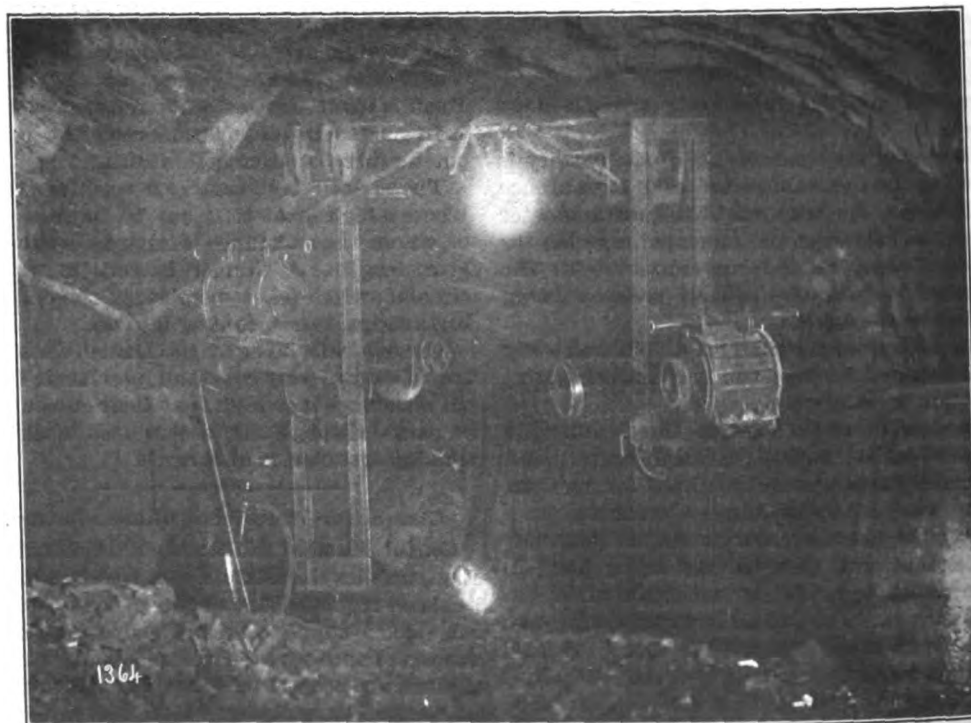


FIG. 3.—POLYPHASE ELECTRIC DRILLS IN JUNGFRAU RAILWAY TUNNEL.

days and two nights at an expense varying from \$25 to \$50, while an electric railway trip to the summit will require only two or three hours and at a very moderate expense. The electric elevator at the summit is operated by a three-phase motor on the elevator cage and

eventually to answer for supplying poor filling acid and the consequent damages that ensue, and in view of this fact, they may reasonably charge the consumer somewhat advanced prices, and they often do charge at times exorbitantly high prices.

Although these guarantees are universally given, the protection so far afforded to the owner of accumulators is often but a relative one and more or less worthless. There is only a very small number of owners of accumulators who are in a position to test the filling

not always free from it. The acid produced from sulphurated hydrogen can be considered free from arsenic. All these acids usually take up during concentration in the usual platinum or platinum-gold apparatus more or less of these metals and their possible impurities, and

The damages resulting to accumulators from filling acid, which is not sufficiently pure, are, however, so considerable that a suitable purification of the sulphuric acid to be employed appears to be absolutely imperative, and particularly in cases where the so-called free arsenic sulphuric acid is used. Such a demand should especially be made in the interests of accumulator owners, but no less in the interest of accumulator manufacturers, inasmuch as they have in most cases to bear the damages resulting from use of an insufficiently purified filling acid. These rigorous conditions would be easily fulfilled by the sulphuric acid manufacturers, for they are in a position by which they can thoroughly cleanse the acid in such a manner as to satisfy every requirement. The mere dilution of concentrated sulphuric acid with water would then be avoided, and thus many an unreliable supply be made to disappear.

Electric Waves.

[From our London Correspondent.]

The Right Rev. Monsignor Gerald Molloy, D.D., D.Sc., of Dublin, has just delivered an interesting discourse before the Royal Institution in London on "Electric Waves." Opening with references to the nature of wave motion, Monsignor Molloy dealt briefly with the work of Clerk Maxwell, Hertz, Branly and Roentgen. He stated that the position of Roentgen's X-rays, though not yet certainly determined, was perhaps seven or eight octaves beyond the highest ultra violet rays so far explored, and that of Becquerel rays not quite so far. Electric waves were far down in the infra-red; they might vary in length from a fraction of an inch to a mile or so, but even the shortest so far produced was many octaves below the limit of infra-red radiations, as now known. Thus he said, the conception of light was reached, but the various forms of energy—light, heat, magnetism, etc., were all trans-

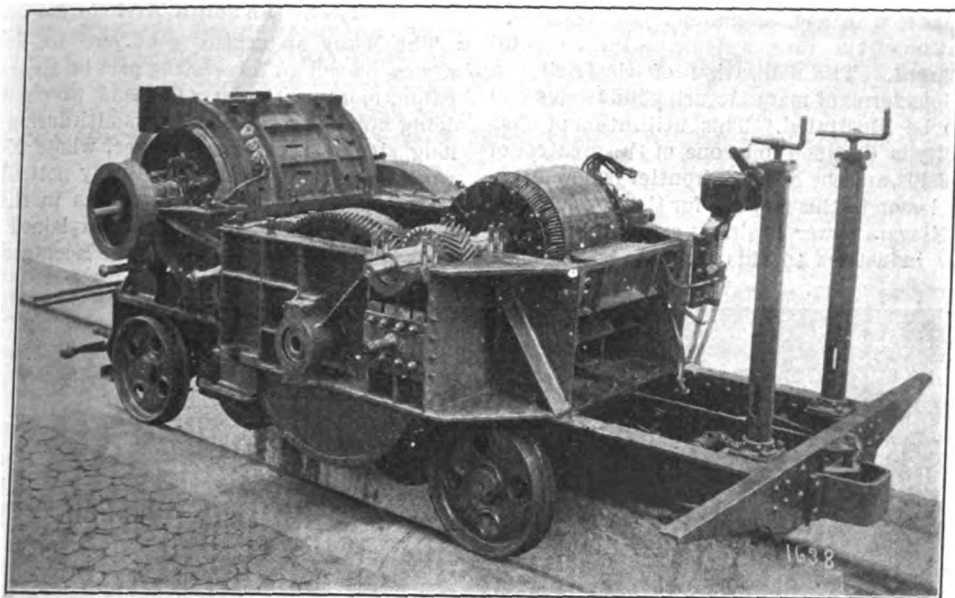


FIG. 4.—VIEW SHOWING REDUCTION GEAR OF ELECTRIC LOCOMOTIVE ON JUNGFRAU RAILWAY.

acid supplied to them for purity and utility, while an examination by an expert is expensive.

However, as the manufacturer undertakes to guarantee the accumulators he supplies for a term of years, on condition that they will always be carefully handled and especially that they will only be filled with pure acid, the examination of the acid supplied for filling them from time to time could be made by the latter; but here also the advantages secured would be considered doubtful, for these facts are mostly ascertained when it is too late. Therefore, the owners of electric accumulators are not always in a position to properly care for them, as they find it impossible to use an acid which is unquestionably clean in compliance with rules furnished them.

From many years of my experience in the manufacture of sulphuric acid, and more particularly in the preparation of filling acid for accumulators, I can testify that only a very small fraction of the filling acid used by the trade is ever purified, particularly that treatment prescribed with hydrothionic acid or sulphuric barium.

In most cases the so-called free arsenic sulphuric acid represented by crude sulphur, or also by the sulphurated hydrogen, as a by-product, is concentrated in platinum and platinum gold boilers at 66° Be., which is simply thinned with water to the specific gravity of the filling acid. Very often the distillation acid obtained in the concentration of the regular sulphuric acid is adulterated to make a filling acid. I have even known of cases where ordinary 66° sulphuric acid, diluted only with water, has been supplied as a filling acid. In many cases impure water is used as an adulteration, such as the water from the mains or from pumps. Of course the latter instances are exceptional cases, therefore only the first-named will be considered.

Sulphuric acid made from raw sulphur is mostly free from arsenic. It contains traces of arsenic, however, for the crude sulphur is

they remain in the acid after its dilution. Iron or other metals of the sulphur-ammonia group are mostly contained in such acids in small quantities, while chlorine exists in differing quantities, and there may be more or less nitric or nitrous acids, but inasmuch as these substances seriously effect the concentration apparatus, endeavors are made to annul these deleterious effects by adding sulphurated ammonia, which is successfully accomplished, but this means has the serious disadvantage in that too much ammonia salt is used,

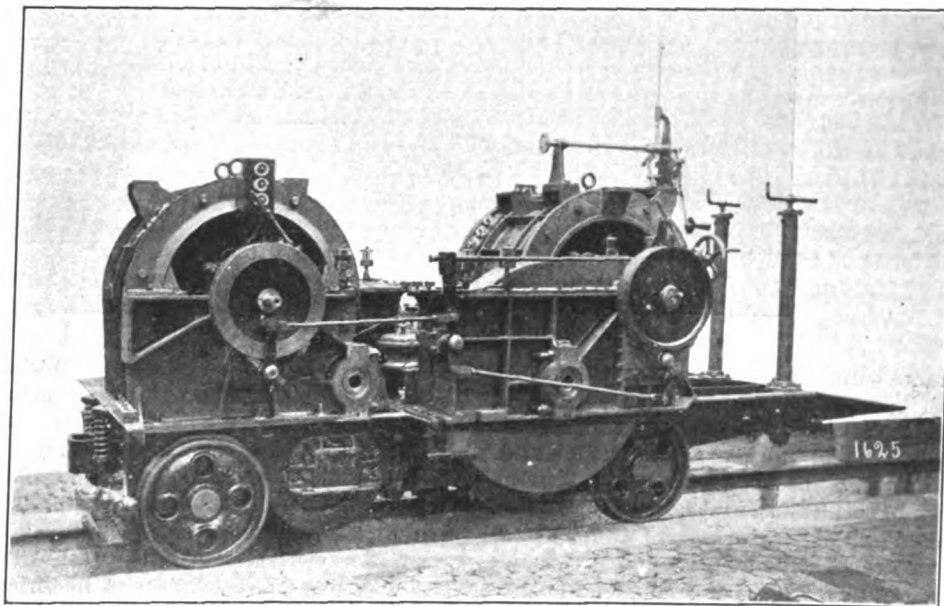


FIG. 5.—TWO 200-HP. POLYPHASE MOTORS ON ELECTRIC LOCOMOTIVE ON JUNGFRAU RAILWAY.

which often remains in quantities of many per cent. in the acid. It is not to be supposed that in most cases there are any organic connections—neither can there be any sulphurated hydrogen, as the acid is not cleansed therewith.

It is clear that such sulphuric acid, merely diluted with water to the specific weight prescribed, cannot give a filling acid purified to the extent required.

mitted through space as vibrations of the ether, being, so to speak, notes of different pitch on the great scale of radiant energy. The lecturer remarked that twentieth century physicists would find out more thoroughly the nature of these ethereal vibrations, and they would also fill up the gaps between the various kinds and perhaps explain the ether—the mystery of mysteries which underlay all these phenomena.

ELECTRICITY AT THE EXPOSITION.

The Dominant Feature of the Pan-American is to be an Unparalleled Electrical Show.

The marvelous progress in the development and application of the various branches of the electrical science and industry of recent years will be shown in the magnificent Electricity Building of the Pan-American Exposition. Like the other large exhibit buildings of the Exposition, this one is of modernized Spanish renaissance architecture, covered with staff, artistically colored and adorned with sculpture. In dimensions it is 500 by 150 feet.

The splendid towers of the Electricity Building rise to great heights, two over the south

interesting exhibit will be that illustrating the application of electricity to the propulsion of cars and vehicles like the automobiles. Most persons are more familiar with the successful operation of such vehicles by electricity than with the means to this end. On this account it is hoped to illustrate them at the Exposition in such a manner that the interrelation of the various elements will be quite apparent. The utilization of electricity in various forms of manufacturing industries will also be illustrated. This utilization of electricity is destined to be one of the greatest of its fields, and the Niagara frontier is now an object lesson in this respect, for the development of Niagara power is almost every day drawing new industries to this region, because the

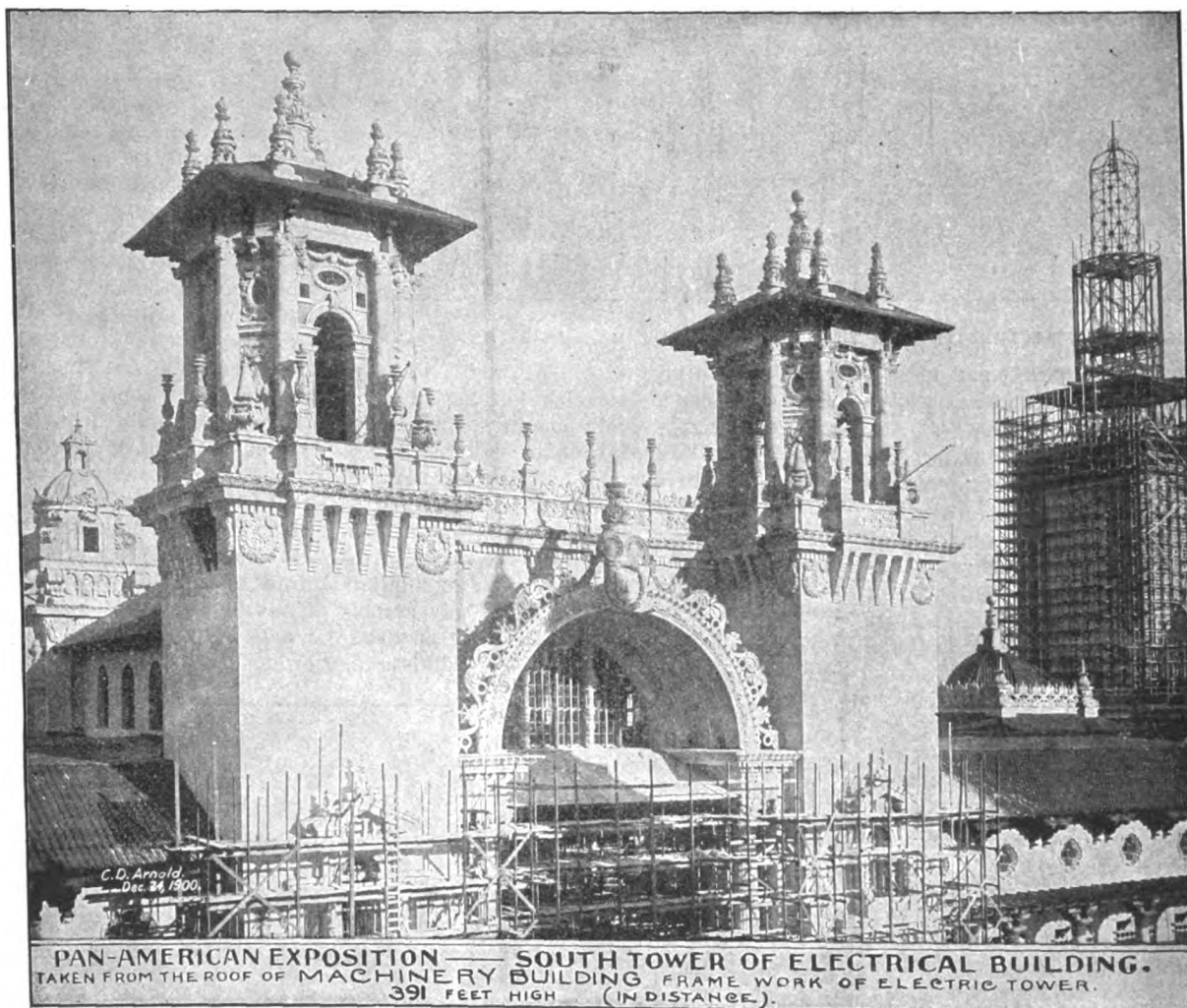
stimulate more general study of this great field of science. J. M.

LONDON NOTES.

(From our London Correspondent.)

X-Rays in the South African War.

The X-ray apparatus sent out to South Africa played an interesting part in the campaign, more particularly the sets which were doing humane service at Ladysmith during the long siege. Lieutenant Bruce, whose X-ray work has already been periodically noticed in the columns of *ELECTRICITY*, was in charge of the department and has just explained the Ladysmith operations before the Roentgen So-



entrance being 158 feet high, and two over the north entrance 128 feet high. They are very elaborate in design and among the most beautiful features of the Exposition architecture.

In ten years the electric motor in its application to both transportation and industry has effected well nigh an industrial revolution. In the electric lighting industry and in the telephone system there has been great progress during this decade. Wireless telegraphy has come to the front within a few years and is destined to effect still further radical changes in methods of electric communication. Automobiles electrically propelled have come into use. In all these fields the Pan-American Exposition will have electrical exhibits illustrating this marvelous progress. There will be a collection of historical matter relating to the subject which will show the gradual development of the apparatus used. An especially

proximity and the availability of this power render the manufacturing opportunities so exceptional. The aim will be to make the electrical exhibit in the Electricity Building a collective one rather than one composed exclusively of individual commercial exhibits. The exhibit will be divided into two groups:

1st. The collective exhibit, which will consist of retrospective exhibits of historical interest illustrating models, or practical contrasts showing the advances in the art.

2d. The commercial exhibit, composed of those exhibits possessing distinctive merit, whether this consists in workmanship, novelties or useful applications.

As a whole, the exhibits in this building will be both attractive and educational in a degree not before realized at any exposition held upon the American continent. They will serve to excite popular interest, and in this way to

ciety, London, in a paper entitled "Experience of X-Ray Work During the Siege of Ladysmith." The photographs which were shown to the audience were excellent, considering the great difficulties under which they were taken and developed. Altogether some 200 cases were subjected to the exposure, and nearly one-half of them were photographed. The Lieutenant related some of the difficulties encountered, the chief being obtaining a supply of electricity, seeing that Ladysmith was not electrically lighted. He has no belief in the system of drawing a dynamo by a cyclist; to charge six cells in that way was like climbing a very steep hill. On one occasion at Elands-laagte the supply of electricity ran out, and a dynamo which Lieutenant Bruce had with him was attached to the shafting of a local flour mill and the arrangement seems to have answered admirably. The experience

gained led the author to think that a properly constructed operating table is required which would enable the photograph to be taken from below. Another point, for field use an outfit was not complete unless it had its own machinery for producing electricity. A small oil motor for driving the dynamo was suggested.

A Three-phase Lighting Scheme.

The local authorities in East Middlesex are combining to carry out a \$2,000,000 three-phase high tension lighting and power scheme. With a 4,000 kw. plant capacity at Edmonton, energy for 500 arc lamps, 100,000 8cp. incandescents, and 500 kw. for motors, would be distributed to sub-stations for the supply of the districts of Edmonton, Enfield, Southgate, Tottenham and Woodgreen. The consulting engineers are Mr. Robert Hammond, and Mr. Wm. W. C. Hawtayne of London. A two-phase system was first thought of, but a three-phase is thought to meet the conditions better.

Two Important Patents Declared Invalid.

The General Electric Company has just had two of its important magnetic blow-out patents declared invalid, and its Knight interlock patent declared not infringed. The United States Circuit Court of Appeals for this circuit has just handed down opinions declaring invalid the two patents, known to the trade as the magnetic blow-out patent, which were granted on the inventions of Elihu Thomson, No. 283,167, dated August 14, 1883, and No. 401,085, dated April 9, 1889. The cases were prosecuted by the General Electric Company, and were defended by the Lorain Steel Company, a sub-company of the Federal Steel, and the decision marks the end of a long litigation and throws the subject matter of the patents open to the public. The first patent, No. 283,167, was broadly for the application of a powerful magnetic field to the contact surfaces of an electric switch in order to blow out or disrupt any arc that might tend to form between those contact surfaces upon the operation of the switch. It was a combination which was found practically necessary to be used in devices for switching or breaking the enormous currents involved in modern trolley service and its use has been widespread. The patent was almost universally respected by the trade, to a degree probably unique among our litigated electrical patents, in consequence of which the litigation in respect to it came only in the last year or two of the term of the patent. The patent came first before Judge Thomas, of the Eastern District, in *Thomson-Houston Electric Company vs. Nassau Electric Railroad Company*, and was by him declared invalid. It came next before Judge Wheeler in *Thomson-Houston Electric Company vs. Bullock Electric Company*, who followed Judge Thomas. Both of these decisions have just been affirmed on appeal. The second magnetic blow-out patent, No. 401,085, was for the combination of insulation with the magnetic blow-out of the earlier patent and was also widely and necessarily employed. It came first before Judge Wheeler in the *Bullock* case, where it was upheld as valid and as infringed. The present decision on appeal reverses this holding and declares the patent invalid like the first. Both patents are held invalid on the general and common knowledge of the art. The Knight interlock patent, which is not of such general interest or importance, is for a two handle regulator or controller and has been narrowly construed and so rendered practically valueless.

THE BERLINER PATENT VOID.

Judge Brown so Decides in the Suit of the American Bell Telephone Company vs. the National Telephone Manufacturing Company.

DECIDED VICTORY FOR THE INDEPENDENT TELEPHONE COMPANIES.

On Wednesday last in Boston Judge Brown, of the United States Circuit Court, decided against the American Bell Telephone Company in the famous Berliner patent case. The suits were the Bell Company against the National Telephone Manufacturing Company and others and the same against the Century Telephone Company, brought to restrain respondents from selling, using or making telephones or telephonic apparatus with the microphone attachment, and to account to the Bell Company for past use, manufacture and sales, upon the ground that such use, manufacture or sale was an infringement of patent.

The cases were argued before Judge Brown a year and a half ago, and as they related to the same patent—the microphone—were put in together and were tried as if they were one case.

The Berliner patent has been considered one of the most important held by the Bell Company, and it does not expire until November 17, 1908.

In February, 1893, the Attorney General of the United States brought a suit against the American Bell Telephone Company in behalf of the United States. It was argued in June, 1894, before Judge Carpenter, of the United States Circuit Court for the District of Massachusetts. Judge Carpenter ordered the cancellation of the patent on the ground of fraudulent delay in the Patent Office and a previous patent issued to Berliner, which disclosed and claimed the identical apparatus claimed in the patent in suit. The case was appealed to the Circuit Court of Appeals which overruled Judge Carpenter, and the United States then appealed to the Supreme Court.

The patent in question was applied for June 4, 1877, by Emile Berliner, and was held in the Patent Office until November 17, 1891, before it was issued to the American Bell Company. More than a year prior to Berliner's application the Government granted to Alexander Graham Bell the fundamental patent on telephony. He claimed "the method of, and apparatus for, transmitting vocal and other sounds telegraphically, as herein described, by causing electrical undulations, similar in form to the vibrations of the air accompanying the said vocal or other sounds, substantially as set forth." He also claimed "the method of producing undulations in a continuous voltaic circuit by gradually increasing and diminishing the resistance of the circuit as set forth." This covered Bell's magneto telephone, which is now, and has been from the first, universally used as the receiver. It has been held that this claim covers the method of all microphones, and that Bell's original patent having expired in 1893 the right to use a microphone for the electrical transmission of speech is open to the world.

Just prior to the expiration of this patent of Bell's, however, the Berliner patent was issued to the Bell Company. It had slumbered in the Patent Office for more than fourteen years, and under it the Bell Company hoped to extend its monopoly for seventeen years longer, or a total period of thirty-two years. The similarity of its claims to those of the original Bell patent will be obvious, viz.: "the method of producing in a circuit electrical undulations similar in form to sound waves by causing the sound waves to vary the pressure between electrodes in constant contact, so as to strengthen and weaken the contact, and thereby increase and diminish the resistance of the circuit substantially as described." This is evidently a distinction without a difference. The second claim covers the transmitter as an apparatus for thus transmitting speech.

The argument of the Bell Company's counsel was that the patent was secured under the rules of the Patent Office, and that it was absolutely impossible for them to have hastened its issue. On the contrary, the United States claimed that the delay was not only unnecessary, but that it amounted to bad faith toward the public on the part of the Bell Company. It also claimed irregular procedure in the Patent Office and the insertion of new material subsequent to the filing of the application; that the original application did not describe the constant contact, variable resistance transmitter as the patent was issued, but that it did describe a "make-and-break" transmitter; that the original application and drawings were twice erased and stricken out and new ones substituted containing the constant contact device, also that the Berliner invention in question was described and disclosed and claimed in combination with the identical apparatus used as a receiver in the patent of November 2, 1880, granted to Emile Berliner.

On May 10, 1897, Justice Brewer of the United States Supreme Court affirmed the decision of the United States Circuit Court of Appeals, thus leaving the Berliner patent unprejudiced before the law, and in exactly the same condition as any other adjudicated patent issued from the Patent Office.

The American Bell Company then brought suit against the National Telephone Manufacturing Company and the Century Telephone Company for infringement. The actions were tried together and this is the suit that has just been decided. Judge Brown in handing down his decision says:

"The decree in this case must be for the defendants. I find the Berliner patent invalid because, at the date of the application, June 4, 1877, Berliner had not made the invention covered by the patents issued to the American Bell Telephone Company on November 17, 1891. It is conclusive that Berliner had not

invented and did not intend to apply for a patent for a constant contact speech transmitter. I find, as a matter of fact, that Berliner did not before June 4, 1877, succeed in transmitting speech; but on the contrary was convinced by his experiments that speech could not be transmitted by the apparatus of the patent in suit.

"I find also that he did not at that date intend to describe or claim the apparatus as a speech transmitter. In view of the original application the complainant's case cannot be established without proof of successful experiments by Berliner. The invention set forth in the patent lay in experiment. In inventions of this class, the true date of conception is the date at which the experiment succeeds.

"The second ground of the decision is that the invention described in the patent is radically different from the invention described in the application. The original application by changes, purporting to be amendments, has been completely transformed into an application for a distinct invention. This transformation is of the most remarkable character and was made after Edison's carbon constant contact speech transmitter was invented and described in a printed publication. Such amendment is illegal, even if Berliner had made the invention before June 4, 1877.

"The third ground of the decision is to the effect that the invention was previously patented by Berliner. Berliner in 1880 took out a patent which covered the speech transmitter of the patent in the suit, applied to its appropriate use in a system, i. e., with a receiver. The effect of claim four of the 1880 patent was to give a monopoly of this instrument applied to its appropriate use without additional invention in making this application.

"By granting the patent of 1880 the Commissioner exhausted his power to issue a second patent whereby the patentee could control all use of this instrument as a transmitter. Having been protected for seventeen years in the use of this transmitter with one receiver, Berliner was not entitled to further protection for use with any and all receivers.

"The fourth ground is that Edison was the prior inventor. August 8, 1886, is the earliest date of Berliner's amendment affecting this controversy. Berliner's amended application is anticipated by Edison's application of July 20, 1877. The defendants owe nothing to Berliner."

The importance of this decision to independent telephone interests cannot be overestimated, as the independent movement was greatly handicapped by the fear that eventually the courts might decide in favor of the Bell Company.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended February 28:

Antwerp, 5 packages motors, \$700; 4 packages motor vehicles, \$850; 51 packages, \$5,554; Australia, 94 packages, \$6,221; Belfast, 1 cable, \$125; Bilbao, 1 package, \$23; Brazil, 8 packages, \$597; Bremen, 2 packages, \$146; British Possessions in Africa, 110 packages, \$5,056; British West Indies, 66 packages, \$563; Central America, 25 packages, \$667; Cuba, 67 packages \$2,072; Ecuador, 14 packages, \$1,320; Glasgow, 81 packages, \$9,034; 69 reels cable, \$24,763; 2 cases auto vehicles, \$2,500; Hamburg, 4 packages,

\$851; 99 cases, \$8,959; Havre, 20 packages, \$2,754; Hull, 45 packages, \$8,462; Liverpool, 75 packages, \$13,353; London, 74 packages, \$11,440; Mexico, 471 cases, \$10,474; Milan, 36 packages, \$3,119; Munich, 1 case, \$500; Naples, 1 case, \$512; Newcastle, 8 cases, \$829; Newfoundland, 7 packages, \$683; Nova Scotia, 3 packages, \$274; Peru, 61 packages, \$5,335; Ramsgate, 1 case, \$100; Reval, 3 cases, \$780; Santo Domingo, 23 packages, \$389; U. S. Colombia, 2 packages, \$60; Venezuela, 36 packages, \$1,306.

PERSONAL MENTION.

Mr. J. Nelson Kelman, formerly of the Stanley Electric Company, has accepted the position of superintendent of the Bay County Electric Company of Colgate, Cal.

Mr. Henry Gordon Stott, who built and equipped the great transformer station in Buffalo, N. Y., has been appointed superintendent of motive power of the Manhattan Railway Company of New York.

Mr. C. W. Sponsel has been elected superintendent of the Eddy Electric Company of Windsor, Conn.

Mr. George Hewes, for ten years manager of the Faribault, Minn., Consolidated Gas & Electric Company, now has a position with the Edison Electric Company at Des Moines, Ia.

INCORPORATIONS.

The W. G. Nagle Electric Company, Toledo, O. Capital stock, \$50,000. Incorporators: W. G. Nagel, S. R. McLaren and R. B. Chane.

The Compton Land, Water & Electric Company, Los Angeles, Cal. Capital stock, \$500,000. Directors: J. G. Compton, North Ontario; G. W. Cox, G. D. Sanford, Los Angeles; O. T. Sutton, Cucamonga, and R. W. Dawson, Azusa.

The People's Electric Light Company, Bowling Green, Ky. Capital stock, \$15,000.

The Meridian Electric Light & Railway Company, Meridian, Miss. Capital stock, \$25,000. Incorporators: J. Kamper, R. W. Stoutz and W. Ambrecht.

The Electric Insurance Company, Trenton, N. J. Capital stock, \$100,000.

The Sanborn-Marsh Electric Company, Indianapolis, Ind. Capital stock, \$15,000. Directors: Gerry M. Sanborn, Ashley M. Sanborn and Harry B. Marsh.

The Traction & Light Company, Trenton, N. J. Capital stock, \$1,000,000. Incorporators: Samuel Thomas and Samuel B. Lawrence, New York, and James C. Young, Jersey City.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED FEBRUARY 26, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

668,680. Electric Attachment for Railway Scales. Matthew H. Reed, Pittsburg, Pa. Filed March 30, 1900.

668,710-668,711-668,712. Electric Railway. George H. Davis, New York City, assignor to Frank R. Ford, George W. Bacon and George H. Davis, same place. Filed Sept. 15, 1900.

668,781. Electric-Traction System. Silvanus P. Thompson and Miles Walker, London, Eng. Filed Oct. 22, 1897.

668,819. Railway Signaling Apparatus. Washington Hume, New Broad Street, County of London, Eng. Filed Oct. 6, 1898.

668,903. Electric Bond for Railway-Rails. Harold P. Brown, Montclair, N. J. Filed April 7, 1900.

668,909. Electric Switch. Christopher J. Doran, Jersey City, N. J. Filed Sept. 11, 1900.

668,931. Trolley-Catcher. Francis W. Powers and Martin L. Snyder, West Lafayette, Ind. Filed Jan. 8, 1900.

668,977. Car-Fender. Adolph G. Carlson, Chicago, Ill. Filed March 29, 1899.

ELECTRIC LIGHTS AND APPLIANCES.

668,630. Electric Lamp Protector. Edward Eckl, Milwaukee, Wis. Filed March 31, 1900.

668,658. Junction-Box for Electric Lighting Systems. Montgomery Waddell, New York City, assignor to the Electric Axle Light & Power Company, same place. Filed Jan. 31, 1900.

668,868. Alternating-Current Series Arc-Lamp. Malcolm H. Baker, New York City, assignor to the Manhattan

General Construction Company of New York. Filed Sept. 5, 1890. Renewed Oct. 4, 1900.

668,880. Electric-Arc Lamp. Peter H. F. Spies, Mount Vernon, N. Y., assignor to himself and Jacob Norden, same place. Filed June 5, 1900.

668,904. Incandescent Electric Lamp. Charles A. Chase, Chicago, Ill., assignor to the General Incandescent Lamp Company, Cleveland, O. Filed Dec. 8, 1900.

668,905. Automatic Circuit-Closer for Arc-Lamp Circuits. George R. Davison, Newark, N. J., assignor to the Manhattan General Construction Company, same place. Filed July 24, 1900.

669,015. Electric-Arc Lamp. Gustav Rasmus, New York City. Filed Nov. 30, 1900.

669,055-669,057. Electric Arc Lamp. Malcolm H. Baker, New York City, assignor to the Manhattan General Construction Company, same place. Filed Sept. 5, 1899, March 12, 1900.

669,058. Inclosed Arc Lamp. Malcolm H. Baker, New York City, assignor to the Manhattan General Construction Company, same place. Filed March 12, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

668,662. Electric Switch. John H. Spangler, Pittsburg, Pa. Filed Feb. 21, 1900.

668,690. Electric Accumulator. Paul F. Ribbe, Charlottenburg, Germany. Filed April 30, 1900.

668,798. Electric Switch. James Jones and James Jones, Jr., Brooklyn, N. Y. Filed Feb. 20, 1899.

668,887. Electric Switch. Peter H. F. Spies, Mount Vernon, N. Y., assignor of one-half to Jacob Norden, same place. Filed Aug. 2, 1900.

668,940. Electromagnetic Separator. Guy H. Waring, Tyrone, Pa. Filed Jan. 30, 1900.

668,963. Motor-Grouping System. Francis H. Shepard, New York City, assignor to the Sprague Electric Company of New Jersey. Filed Jan. 21, 1901.

668,978-668,979. Controlling Device for Electric Motors. Adolph G. Carlson, Chicago, Ill. Filed May 19, 1899.

669,052. Attachment for Static Electrical Machines. Gustavus Werber, Washington, D. C. Filed April 24, 1900.

669,058. Electric Amalgamator. Louis H. Barricks, San Francisco, Cal., assignor of one-half to Jesse G. Tunnicliffe, same place. Filed Aug. 6, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

668,658. Telephone Signaling Device. William O. Meissner, Chicago, Ill., assignor to Peter C. Burns, same place. Filed July 5, 1898.

668,702. Telephone-Transmitter. David H. Wilson, Chicago, Ill., assignor to Jay Morton, same place. Filed April 29, 1899.

668,907. Selective Signaling Apparatus. John A. Barrett Summit, N. J., assignor to the American Telephone and Telegraph Company of New York. Filed Sept. 20, 1900.

MISCELLANEOUS.

668,622. Secondary Battery. William R. Bowker, Waltham, Mass. Filed Feb. 15, 1900.

668,639. Motor Road-Vehicle. Charles E. Hadley, Hartford, Conn., assignor to the Columbia and Electric Vehicle Company, same place and Jersey City, N. J. Filed July 8, 1899.

668,661. Electric Bathing Apparatus. Oscar Echnelder, New York City. Filed July 12, 1900.

668,664. Storage-Battery System for Signaling Circuits. Nathan H. Suren, Needham, Mass. Filed June 19, 1899.

668,667. Charging System for Secondary Batteries. Montgomery Waddell, New York City, assignor to the Electric Axle Light and Power Company, same place. Filed Feb. 15, 1900.

668,708. Electric Cigar-Lighter. Charles A. Bernhardt, Detroit, Mich. Filed Jan. 15, 1900.

668,781. Apparatus for Connecting Storage Batteries with Charging-Lines. Nathan H. Suren, Needham, Mass. Filed June 29, 1899.

668,789. Automobile. Joseph Break, Spokane, Wash. Filed May 21, 1900.

668,779. Apparatus for Controlling Connections of Storage Batteries with Charging Circuits. Nathan H. Suren, Needham, Mass. Filed June 29, 1899.

668,791. Process of Electrical Separation of Conductors from Non-Conductors. Lucien I. Blate, Lawrence, and Lawrence N. Morscher, Neodesha, Kans. Filed March 16, 1899.

668,889-668,890. Telautograph. George S. Tiffany, Evans-ton, Ill., assignor to the Gray National Telautograph Company, New York City. Filed Oct. 19, 1900.

668,891-668,892-668,893-668,894. Telautograph. George S. Tiffany, Brooklyn, N. Y., assignor to the Gray National Telautograph Company, New York City. Filed Nov. 20, 1900, Dec. 20, 1900.

668,895. Method of Telautograph Transmission. George S. Tiffany, Brooklyn, N. Y., assignor to the Gray National Telautograph Company, New York City. Filed Dec. 21, 1900.

668,914. Power Transmitting and Reversing Gear. Oratus S. French, Fremont, Ohio. Filed Nov. 12, 1900.

THE TELEPHONE WORLD.

Telephone Companies to Combine.

A movement has been inaugurated in York, Pa., having in view the organization under one management of all the independent telephone lines in Pennsylvania, Maryland, Virginia and West Virginia. A committee of officials from the various lines of Pennsylvania has been appointed to work out the basis on which the different companies will be admitted to the new organization. The new company will be capitalized at \$27,000,000.

At the last meeting of the city council permission was granted the Memphis, Tenn., Telephone Company to begin the construction of its telephone plant. It was ordered, however, that underground construction should not begin until April 15, after all danger from frost had passed. The rates fixed in the contract between the city of Memphis and the company are \$48 per annum for business 'phones and \$36 for residence. The company is required to execute a bond in the sum of \$10,000 for the faithful performance of the contract. The contract further provides that the company shall furnish 15 free 'phones for the use of public offices. It is estimated that the construction work and equipment of the new plant will require the expenditure of about \$500,000. The number of employees required to operate the new system after completion will be close to 100.

A new telephone line about 550 miles in length is being constructed from Point Richmond, the terminus of the Santa Fe Railroad on San Francisco Bay, through Stockton by way of Bakersfield to Los Angeles, Cal. The line will follow the Santa Fe road and quite a number of new stations will be opened as the towns along the new trans-continental road have not been supplied with telephone communication heretofore. Several gangs of men are employed on the new system and it is being rushed to completion as fast as possible, but it will probably be two months before it is finished.

The management of the Detroit, Mich., Telephone Company, which was absorbed by the Michigan Company some time ago, but whose exchange is still in operation with a few hundred subscribers, announces a reduction of rates to \$32 for business and \$20 for residence 'phones, thus cutting under the rates which the new People's Telephone Company intends to charge. This is the first step in the war against the new company. When the People's Company plant is finished next fall Detroit will have three telephone systems.

Waterford, Me., must be connected with the rest of the world by a telephone line. This was the unanimous opinion of B. G. McIntire, Dr. C. M. Coolidge, C. D. Morse and about fifteen other business men of Waterford, who met to talk over the matter recently. The proposed line will be about 25 miles in length, connecting the villages of East Stoneham, North Waterford, Waterford and South Waterford with Paris and Norway.

A dispatch from Ottawa states that there is evidently good ground for the report published some days ago regarding the intention of the Canadian Government to nationalize the Canadian telegraph and telephone systems. The report is most insistent that negotiations are already well advanced looking to the acquisition of the great Northwestern telegraph system, the Canadian connection of the Western Union.

At a recent conference between citizens of Burwell, Neb., and representatives of the Broken Bow Telephone exchange it was decided that the exchange would extend its line from Taylor to Burwell, and from Comstock to Ord, giving Burwell connections with both places, as well as with Kearney and Broken Bow, Neb.

It has been authoritatively announced that the Sunset Telephone Company has decided to establish a telephone system between Bellingham Bay and Lynden and Sunas City, Wash., and other intermediate points, including Wier, Everson, Clearbrook and Nooksack, Wash.

The Southern New England Telephone Company, operating under a Bell license in Connecticut, and in which the American Telephone & Telegraph Company owns a 35 per cent interest, has filed a certificate of increase of capital from \$5,110 to \$7,600 shares.

A telephone company has been organized at Moulton, the county seat of Lawrence County, Ala. A telephone system will be put in there at once and the town will be connected with the Decatur and all surrounding towns.

The Denison & Choctaw Telephone Company has sold its line and exchange at Durant, I. T., to Captain Hughes of Bonham.

Annual Meeting of the Iowa Telephone Association.

The fifth annual meeting of the Iowa Telephone Association will convene in the club rooms of the Savary Hotel at Des Moines, Ia., on Tuesday, March 12, at 2 o'clock P. M., for a two days session. One of the most important questions to be discussed at this meeting is the matter of checking reports and making settlements between companies for inter-line toll business. Another very important subject which will be discussed at this meeting is "Farmers' Lines," their construction, equipment and the rates to be charged them, etc.

A large number of farmers and others interested in the extension of rural telephone lines met in New Castle, Ind., a short time ago and organized the Henry County Telephone Company. The capital stock is to be \$10,000 in shares of \$25 each. The purpose is to unite under one general management all the rural and small independent telephone systems of the county for purpose of co-operation in service and rates. The system will be extended to include all the larger towns of Henry County.

From St. Paul, Minn., comes the report that the first of April will see a reorganization in the present tangled affairs of the Mississippi Valley Telephone Company. The company because of insolvency is now in the courts, and the time for filing claims has practically expired. The receiver, E. E. Webster, of Minneapolis, is engaged in preparing his report for the court, and it will probably include a proposition for reorganization. Minneapolis and St. Paul financiers are desirous of getting control of the plant, and if the project goes through the reorganization will follow. No construction work of any kind is being done.

The Union Telephone Company of Alma, Mich., with lines reaching Saginaw and Northwestern Michigan, and the National Company of St. Johns, with lines to Lansing, Owosso, Pawamo and Ithaca, and connections with a large portion of the State, have decided to unite forces. The Union Company has \$73,000 paid in, and the National about \$20,000, and this will be the basis of union. The stock of the Union Company is held in dozens of villages in which the company does business, while the National stock is nearly all owned by John H. Fildew and John T. Millman. Both companies have earned good money.

The telephone competition, for which the citizens of Camden, N. J., have longed for many years, will within a few weeks be a reality. The superintendent of the Eastern Telephone & Telegraph Company reports that the central station equipment is entirely completed, and that the work of drawing the underground cables through the conduits and of stringing the overhead cables is nearly completed.

News from Whitefish Point, Mich., states that the steel "storm-warning tower" is now in place, and the light station will be connected by telephone with Grand Marais in the spring. All but 18 miles of the 50-mile line is now strung. There will be five life-saving stations, and the Whitefish Point lighthouse on the line.

Clark Grier, manager of the Macon and Dublin, Ga., Telephone Company, has petitioned the city council of Dublin for the right to establish and maintain a telephone exchange in that city. For several years Mr. Grier has operated a long distance line from Dublin to Macon, but has not attempted to compete with the Dublin telephone exchange for local business.

Although the ordinance regulating telephone rates in Kansas City, Mo., at \$45 and \$30 has been a law for several weeks no public attempt has been made to enforce it. R. B. Middlebrook, city counselor, is studying telephone legislation in other cities and is making a thorough investigation of legal tests that have been made, in an effort to decide how best to proceed under the new ordinance.

The common council of Battle Creek, Mich., has adopted a resolution instructing a committee to investigate and report upon the advisability of amending the city's charter so that it may own its municipal telephone plant. The citizens appear to be greatly in favor of the project.

An independent telephone company is preparing to put in an exchange at Hillsboro, Tex. Four hundred and fifty subscribers are announced. It will put in the Stromberg Carlson central flash light system.

William Gest & Co. of Cincinnati were recently awarded the contract for the construction of a new telephone and conduit system for the city of Memphis. The contract amounts to \$250,000.

At the annual meeting of the City & Suburban Telegraph Association (the telephone company) of Cincinnati, O., the old board of directors consisting of Capt. G. N. Stone, Henry Hanna, C. H. Kilgour, George Bullock, John Kilgour and C. J. French, was re-elected. The directors organized as before. President Stone's annual report showed that the company had handled 281,071 messages during the year, or an average of 637 a day. The following annual treasurer's report for the year ending December 31 is included: Capital stock outstanding, \$3,465,000; gross earnings, \$590,064.08; gross expenses, \$377,365.71; available for dividends, \$221,798.37.

At a recent meeting held at Alsen, S. D., a telephone company was organized to be known as the A. B. and F. Telephone Company. The shares of stock were taken principally by farmers in the vicinity of Alsen. The new company promises to run a line via Emmet to Beresford from Alsen and there connect with the long-distance telephone. The following officers were elected: C. B. Jacobson, president; A. Hendrixson, vice-president; Andrew Anderson, secretary; Rev. Father Traynor, Peter Lass and C. B. Thompson, board of directors.

L. W. Bailey, who is raising the money for the telephone line between Casper and Lander, Wyo., reports success in the enterprise and states that he will soon have \$9,000 worth of stock subscribed in Casper, after which he will go to Lander for the remainder. The line will run through Roades' road ranch, Hobert, Keg Springs, Walton, Buck camp, Muskrat, Golden Lake and the agency to Lander.

The directors of the Racket River Telephone Company of Potsdam, N. Y., have decided to raise the rates on commercial 'phones to \$15 a year. Formerly they were \$12. The rates for residences will remain \$12. The company has made many improvements to its system since it was first installed and gives excellent service with an all night service and Sunday hours.

The directors of the Troy, N. Y., Telephone & Telegraph Company met a short time ago for organization. The following were elected: President, George P. Ide; vice president, W. C. Humstone; second vice-president, Alba M. Ide; secretary, H. J. Richmond; treasurer, J. J. Fitzsimmons; general manager, Henry E. Hawley.

J. T. Hays, of Tallahassee, Fla., and associates are asking a city franchise to establish an independent telephone system in Pensacola of that State. The indications are that the franchise will be granted.

A telephone line is being built from Laurel Blumery Tenn., to Cut Laurel Gap, N. C. With the completion of this line, Johnson County, Tenn., will have very good telephonic connection.

The Sedgwick County, Kan., telephone bill has reached the Senate. It was introduced by Senator Tapp and authorizes Sedgwick County to construct and maintain a local and long-distance telephone system.

The Carthage, Mo., Electric Telephone Company has completed its new line to Oronogo and now has direct connection with Oronogo, Neek City, Quaker Mills and Mansur.

The Independent Telephone Company is quietly going about the establishment of its system in Binghamton, N. Y., and before many months it will be in operation.

A. Ross has completed arrangements for instituting a telephone exchange in Webster, S. D., as soon this spring as the poles can be set.

Geneva, N. Y., may install a telephone fire alarm system.

TELEPHONE INCORPORATIONS.

The Telephone Directory Publishing Company, New York City. Capital stock, \$3,000. Directors: J. G. Quigley, J. P. Howard and L. W. E. Ianes, New York City.

The Farmers' Exchange Telephone Company, Camp Point, Ill.—to operate a telephone line. Capital stock, \$2,000. Incorporators: J. E. Simmonds, Leonard G. Hoke and Rufus McVay.

The Davilla Telephone & Improvement Company, Davilla, Tex.—to construct and operate a telephone system in Milam, Bell and Williamson Counties. Capital stock, \$10,000. Incorporators: J. C. Cronk, Robert P. Kerr, E. H. White and others.

The Globe Automatic Telephone Company, Chicago—to do a manufacturing and telephone business. Capital stock, \$25,000. Incorporators: John E. Norling and others.

GENERAL ELECTRICAL NEWS.

Lighting.

Amherst, Wis.—This village contemplates the erection of an electric light plant.

Ashton, Ill.—A movement has been started to erect an electric light plant in this city.

Belfry, Pa.—Worcester farmers are contemplating the erection of a township electric light and power plant at this place with a local telephone system.

Berryville, Va.—The question of establishing an electric light plant in this town is being agitated.

Breese, Ill.—The village council has decided to establish an electric light plant. F. Burhorn, H. Niemann and B. Ess are on the committee.

Canton, Ga.—Capt. T. M. Brady will install an electric light plant for his place of business, and probably the plant will be large enough for lighting the town.

Carsonville, Mich.—The question of bonding for electric lights will be voted on this month.

Collinwood, O.—This place will be bonded for the sum of \$22,000 to establish an electric light plant and \$40,000 to extend the waterworks system.

Cooperstown, N. D.—Wm. Brueske is figuring on putting in an electric light plant here.

Fort Valley, Ga.—Crandall & Gray contemplate establishing an electric light plant.

Grantsburg, Wis.—A. P. Nelson is here investigating with a view to building an electric light plant.

Holstein, Ia.—A municipal electric light plant is being talked of in this town.

Hot Springs, S.D.—Messrs. Parks & Mueller, owners of the electric light plant here, contemplate the purchase of new machinery soon.

Jonesboro, Ind.—It is proposed soon to erect an electric light plant here.

Mayville, Mich.—The proposition to bond this village for an electric lighting plant will be voted on by the citizens at the spring election.

Mediapolis, Ia.—The city council is preparing to erect an electric light plant.

Minneapolis, Minn.—The Donaldson Glass Block of this city will erect a new addition to its lighting plant.

Nashua, N. H.—A resolution will be presented at the next council meeting, calling for the appointment of a committee to look into the cost and advisability of building an electric light plant under municipal ownership to furnish lights for the streets of this city. Ed. Everett is at the head of the movement.

Pine Bluff, Ark.—The city council has granted to the Pine Bluff City Lumber Company a franchise for building an electric street railway and lighting plant here. It proposes to erect a \$150,000 lighting plant.

Port Deposit, Md.—The Jacob Tome Institute has purchased the plant of the Port Deposit Electric Light Company, and will enlarge the same by installing new dynamos, etc.

Reading, Mich.—The citizens will vote on the proposition to light this village with electricity at the approaching spring election.

Rutland, Vt.—The following question is to be inserted in the warrant for the coming city election: Shall the city of Rutland build, or purchase, equip and manage an electric light plant for the purpose of furnishing light for the city and its citizens?

Sauk Rapids, Minn.—The village council has passed an ordinance granting to the Light, Heat, Transit & Public Service Company the right to erect and maintain an electric lighting plant.

Silverton, Col.—The Silverton electric light plant has been purchased by a company headed by F. C. Adams and J. J. Henry. The new company will enlarge the plant.

Tampa, Fla.—This city contemplates the erection of an electric light plant.

Valentine, Neb.—S. F. Gilman, who owns the flouring mill here, which is propelled by water power, is going to employ the surplus power in supplying an electric light plant for street and domestic lighting.

Wallowa, Ore.—This place will be equipped with a new electric lighting plant.

Street Railways.

Cassville, W. Va.—James A. Milholland, of Cumberland, has lately been here looking after the interests of the Cassville & Morgantown Railroad, a big electrical enterprise that will run 15 miles through this district.

Charles City, Ia.—S. L. Kern of this place and G. W. Dawson of Waterloo have asked for a franchise to operate an electric street car line in this city, and the question will be submitted to the voters at the March election. They propose to build a line from this city to Greene in Butler County, a distance of 20 miles.

Chicago.—If the extension of the franchise of the Chicago City Railway Company for a term of years on terms reasonable to both the company and the municipality is granted, President D. G. Hamilton says that the traction company stands ready to expend nearly \$9,000,000 on the construction of a new plant and the purchase of an entire new equipment.

Frankfort, Ky.—An electric railway is to be constructed between here and Lawrenceburg, Ky. Surveyor A. C. Parker has completed a survey of the proposed route, together with an estimate of the cost.

Georgetown, Del.—There is talk of building an electric railway from Seaford to Bethany Beach, by way of this town.

Lexington, Ky.—The Lexington Railway Company has decided to add considerable machinery to its power plant, also to build an extension in the suburbs. R. L. Williams of Richmond, Va., is president of the company.

Monterey, Mex.—G. K. Wright of Chicago has been granted a concession for the construction of a system of electric street railways here.

Monticello, N. Y.—The Monticello, Fallsburg & White Lake Railroad has been organized to build a new sixteen-mile trolley road through Sullivan County, to carry passengers, freight and dairy and farm products between here, Fallsburg and White Lake.

New Coeln, Wis.—If citizens of this place meet certain conditions, the Milwaukee Street Railway Company will extend its Howell avenue car-line here, which is a distance of about two miles.

New York City.—The plans to connect this city and Philadelphia by trolley via Somerville, N. J., are fast progressing. The tracks of the Philadelphia & New Jersey Railroad and the Philadelphia & Bristol Railroad Company will be used. Heavy tracks will be laid. The single-trip fare between Philadelphia and this city will, it is stated, be \$1.

Philadelphia, Pa.—The stockholders of the Carbon County Electric Railway Company, of which I. A. Sweigard is president, recently voted to increase the present capital stock of \$60,000 to \$300,000. The increase will be used to improve the present line and to make extensions through Lehighton to Millport, and from Lehighton to Stroudsburg, and the Delaware Water Gap, the surveys of which have already been made and the right-of-way practically secured.

Port Clinton, O.—The Lakeside, Napoleon & Western Electric Railway was organized here last week by Eastern capital, and will run from Napoleon to Bowling Green and Fremont, thence to Port Clinton, Lakeside, Piccolo, and Marblehead. The route will be 50 miles in length.

Schenectady, N. Y.—The right-of-way has been secured for an electric road from here to Ballston where it will connect with the road to Saratoga.

Toledo, O.—The county commissioners recently granted J. L. Yost and F. V. Collins a franchise for an electric road on the Holland road to Delta.

Williamston, Mich.—The village council has granted a franchise for an electric railroad, which it is proposed to build from Detroit to Lansing.

Company Matters.

Indianapolis, Ind.—The Sanborn and Advance Electric Companies have been consolidated, and the obligations of both are assumed by the new company under the name of the Sanborn-Marsh Electric Company.

Manufacturing.

Adrian, Mich.—James Gilliland has completed negotiations with the American Electric Fuse Company and the American Specialty Company, both of Chicago, and both manufacturing electrical specialties. F. G. Jones is president, and the two plants will be moved here to be run in conjunction with the Gilliland Electric Company. The concerns have ample financial backing. Mr. Gilliland stated that the removal will be effected by May.

Newark, N. J.—The Electric Insulation Company, capitalized at \$400,000, will manufacture electric supplies. Elijah Woodward, C. H. S. Woodward and Louis A. Ziegler, all of this city, are connected with the concern.

Penn Yan, N. Y.—The manufacture of the device recently patented by Fred Carroll, of this place, for the automatic turning of switches on electric lines will shortly be begun.

Portland, Me.—The Safety Electric Switch Company, capitalized at \$150,000, proposes to manufacture, buy, sell and lease all kinds of machinery used in electricity. J. F. Fanning and A. C. Percy, Portland; A. C. Dresser, Standish; A. A. Bohn, H. A. Greenough and E. P. Hughes, Providence, R. I., are the promoters.

Trenton, N. J.—The Weber Self-Playing Piano Company has been formed lately for the purpose of manufacturing self-playing pianos to be operated by an electrical apparatus. Henry C. Holton, August Wartman, Adam J. Osterle, Wilmot L. Moorehouse and Joseph Weber are all interested in this enterprise, which is capitalized at \$200,000.

Utica, N. Y.—The Johnson & Morton Company has purchased property in this city, and as soon as the frost is out of the ground will begin the erection of a factory building for the manufacture of electrical supplies.

Power and Transmission.

Augusta, Me.—A. O. Lombard is now at work on the plans for a new log hauler, which will be run by electricity. This will necessitate the establishing of a power plant in the woods and the running of a trolley line, but it is believed that it can be done successfully and economically.

Halltown, W. Va.—A syndicate, of which ex-Governor Lloyd Lowndes, of Cumberland, Md., is interested, proposes to harness the Shenandoah River near here to generate for the lighting of the towns of Charlestown, Shepherdstown, Winchester, Martinsburg and Berryville, Va., and also to furnish motor power for any industries in said towns that may desire it.

Spokane, Wash.—The Big Bend Power Company was lately organized for the purpose of establishing plants for the generation of electricity for power, illuminating and other useful purposes. The capital stock is fixed at \$300,000. William E. Eldridge and William T. Stoll of Spokane, David Wilson of Davenport, Wash., C. A. Hamilton of New York City, and E. S. Miller of Jersey City are interested in the scheme.

Automobiles.

Amesbury, Mass.—A representative of a New York motor vehicle company has bought all the motor vehicle bodies now in stock in the local carriage factories, and has placed orders with the builders here amounting to \$500,000 for future shipment. The local firms will ship the bodies finished and trimmed, all ready to hang on the gear part. The firms will ship the orders as fast as turned out, and it is expected that the employees will be kept busy until July.

New Orleans, La.—G. Herbert Condict, of New York, consulting engineer for the Electric Vehicle Company of Hartford has recently been in this city looking over the field with a view of reporting to the company on the advisability of establishing a line of electric cabs and delivery wagons here.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by **ELECTRICITY** from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: *ort* indb., certificate of indebtedness; *coll.*, collateral; *cons.*, consolidated; *const.*, construction; *conv.*, convertible; *com.*, common; *deb.*, debentures; *exten.*, extension; *gen.*, general; *g.*, gold; *guar.*, guaranteed; *inc.*, income; *imp.*, improvement; *pd.*, paid; *pfid.*, preferred; *mtg.*, mortgage; *tr.*, trust; *A.*, annually; *S.*, semi-annually; *Q.*, quarterly; *A. & O.*, Apl. and Oct.; *F. & A.*, Feb. and Aug.; *M. & S.*, May and Sept.; *J. & D.*, July and Dec.; *J. & J.*, Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

NAME.	Capital Stock.			Rate and Date of Last Div.	Bid.	Asked.	NAME.	Capital Stock.			Rate and Date of Last Div.	Bid.	Asked.
	Par	Authorized	Issued					Par	Authorized	Issued			
Albany, N. Y.—Mar 4							Hartford Conn.—Mar 4						
United Traction.....	100	\$5,000,000	\$5,000,000	1 1/2% Q.	109	110	Hartford Street Ry. Co.....	100	\$4,000,000	\$200,000	5% S. Oct.	100	—
(Consolidation of the Albany and Troy City Railway.)							Hartford & West Hartford RR.....	100	1,000,000	247,000	—	—	—
Allentown Pa.—Mar 4							Holyoke Mass.—Mar 4						
Allentown & Lehigh Val. Trac. Co.	—	4,000,000	1,800,000	—	—	15	Holyoke Street Ry. Co.....	100	600,000	400,000	4% A. June	207 1/2	212
Bridgeport, Conn.—Mar 4							Hoboken N. J.—Mar 4						
Bridgeport Traction Co.....	100	2,000,000	2,000,000	1% Aug.	100	—	North Hudson Co. (N. J.) Ry. Co..	25	1,250,000	1,000,000	5% S.	180	—
Baltimore Md.—Mar 4							Indianapolis, Ind.—Mar 4						
United Railways & Elec. Co. com.	50	\$4,000,000	12,000,000	—	16	16 1/2	Indianapolis Street Ry.....	—	5,000,000	5,000,000	—	27	29
Boston, Mass.—Mar 4							Lancaster, Pa.—Mar 4						
New England Street Ry.....	25	5,000,000	1,081,925	1% Q. Jan. 15.	—	15	Pennsylvania Traction Co.....	100	10,000,000	9,900,000	—	—	—
North Shore Traction Co.....	100	4,000,000	4,000,000	—	—	—	Lancaster & Col. Electric Ry.....	—	—	87,500	—	—	—
North Shore Traction Co. pfid.	100	2,000,000	2,000,000	6% S. A. & O.	—	—	West End Street Railway.....	—	—	—	—	—	—
West End Street Ry. Co. com.	50	10,000,000	4,000,000	8% S. Oct. '90.	112	118 1/2	Louisville, Ky.—Mar 4						
West End Street Ry. Co. S. pfid.	50	4,000,000	4,000,000	4% S. Jan.	112 1/2	118 1/2	Louisville Ry.....	100	4,000,000	3,500,000	1 1/2% S. April.	92	95
Boston Elevated R. R.....	100	10,000,000	—	2 1/2% Aug. 90.	106 1/2	109	Louisville Ry.....	100	2,500,000	2,500,000	2 1/2% S. Oct. 1.	112	118
Brooklyn N. Y.—Mar 4							Minneapolis, Minn.—Mar 4						
Brooklyn City Ry.....	100	2,000,000	1,928,400	—	235	240	Twin City Rapid Transit.....	100	17,000,000	15,010,000	—	—	—
Brooklyn Rap. Transit Co., tr cert.	100	42,000,000	42,000,000	—	75	75 1/2	Twin City Rapid Transit.....	—	8,000,000	1,712,300	1 1/2% S. Oct.	104	107 1/2
Brooklyn Heights Railroad.....	—	200,000	200,000	—	107	109	Montreal, Canada.—Mar 4						
Brooklyn City RR.....	100	12,000,000	12,000,000	5% Q. Jan.	207	209	Montreal Street Ry. Co.....	50	4,000,000	4,000,000	5% S. M. & N.	208 1/2	205
Brooklyn, Queens Co. & Sub. RR.	100	2,000,000	2,000,000	—	—	—	Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1 1/2% S. J. & J.	106 1/2	109 1/2
Coney Island & Brooklyn RR.....	100	2,000,000	1,884,200	2 1/2% Nov. '90.	325	323	Memphis Tenn.—Mar 4						
Kings County Elevated.....	100	4,750,000	4,750,000	—	—	—	Memphis Street Railway Co.....	100	900,000	800,000	—	25	—
Kings County Traction Co.....	100	4,500,000	4,500,000	1% July	75	80	New Haven, Conn.—Mar 4						
Nassau Electric Railroad.....	50	6,000,000	6,000,000	—	—	—	Fair Haven & Westville RR.....	25	2,000,000	2,000,000	5% S. Sept.	39	41
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000	—	—	—	New Haven Street Railway Co.....	100	1,250,000	1,000,000	2 1/2% A. July	—	—
Brooklyn, B. & W. M. Railroad.....	—	1,000,000	1,000,000	—	—	—	New Haven & Centerville.....	100	700,000	800,000	—	—	—
Buffalo N. Y.—Mar 4							Winchester Avenue RR.....	25	1,000,000	600,000	—	45	46
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	—	74	75	New Orleans, La.—Mar 4						
Buffalo Railway Co.....	100	6,000,000	5,870,500	1% Q. Dec. '90.	99	100	Canal & Claiborne RR. Co.....	40	240,000	240,000	4% S. July	—	—
Columbus O.—Mar 4							New Orleans & Carrollton RR.....	100	1,200,000	1,200,000	1 1/2% Q. Oct.	148 1/2	150
Columbus Street Railroad.....	100	8,000,000	8,000,000	1% Q. Feb.	36	39	New Orleans Traction Co new com.	100	—	—	—	23 1/2	24
Columbus Street Railroad, pfid.....	100	1,500,000	1,500,000	—	92	95	New Orleans Traction Co new pfid.	100	—	—	—	25	26
Charleston, S. C.—Mar 4							Orleans City RR.....	100	2,000,000	2,000,000	5% S. Jan.	20 1/2	20
Charleston City Ry. Co.....	50	100,000	100,000	5% S.	—	—	New Or. City & Lake RR.....	50	2,000,000	2,000,000	4% S. Jan.	—	—
Enterprise City RR. Co.....	25	1,000,000	200,000	—	—	—	Orleans Railroad.....	50	500,000	185,000	1 1/2% S. June	—	—
Chicago, Ill.—Mar 4							St. Charles Street Railway.....	50	1,000,000	1,000,000	1 1/2% S. Oct.	54 1/2	57
Chicago City Ry. Co.....	100	12,000,000	12,000,000	5% Q. Dec. 31, '90.	253	263	New York—Mar 4						
Chicago & South Side R. T. RR.....	100	10,528,800	10,528,800	—	—	—	Central Crotona RR.....	100	600,000	600,000	2 1/2% Q.	255	260
Lake Street Elevated RR.....	100	10,000,000	10,000,000	—	9 1/2	10	Christopher & 10th Sts. RR. guar.	100	650,000	650,000	2% Q. Oct.	175	185
Metropolitan West Side Elev. Ry....	100	15,000,000	7,000,000	Feb 28 1900.	82 1/2	88	Dry Dock, E. Broadway & Battery RR.	100	1,200,000	1,200,000	1 1/2% Q. Nov.	120	125
Met. West Side El., pfid.....	100	15,000,000	9,000,000	—	79	80	Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000	2 1/2% Q. Feb. 1900.	163 1/2	173 1/2
North Chicago Street RR.....	100	10,000,000	6,800,000	5% Q. Jan.	208	210	Bleecker St. & Fulton St. Ry. guar.	100	900,000	900,000	1 1/2% S. July.	85	87
North Chicago City RR.....	100	800,000	249,900	—	197	200	Broadway & Seventh Ave. Ry. guar.	100	2,100,000	2,100,000	2 1/2% Q.	262	260
South Chicago City Railway.....	100	2,000,000	1,608,200	—	99 1/2	101	Can. Park, N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2 1/2% Q.	194	200
West Chicago St. R. R. Co.....	100	20,000,000	15,159,000	1 1/2% Q. Feb.	104 1/2	103	Eight Avenue RR.....	100	1,000,000	1,000,000	—	890	405
Union Traction Ry.....	100	1,250,000	624,900	5% S.	15	15 1/2	42d St. & Grand St. Ferry RR. guar.	100	700,000	748,000	4% Q.	892	402
Union Traction Co.....	100	2,000,000	2,000,000	5% S.	56	56 1/2	Ninth Avenue RR.....	100	800,000	800,000	—	198	201
Cincinnati, Ohio.—Mar 4							Twelfth Avenue RR.....	100	2,000,000	2,000,000	—	205	225
Cincinnati Inc. Plane Ry.....	50	1,000,000	575,000	—	—	—	Twenty-third St. R. R. Co. guar.	100	800,000	800,000	4% Q.	400	410
Cincinnati Inc. Plane Ry. pfid.....	50	150,000	150,000	—	—	—	Second Avenue RR.....	100	2,500,000	1,852,000	2 1/2% Q. Jan.	198	201
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	1 1/2% Feb.	75	76	Third Avenue RR.....	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.	121	121 1/2
Cincinnati Street Ry. Co.....	100	15,000,000	14,000,000	1 1/2% Q. Jan.	124 1/2	125	42d St. Manhattan & St. Nich. Av.	100	2,500,000	2,500,000	—	65	75
Eden Park & Adams Inc. Ry.....	50	2,500,000	2,300,000	1 1/2% Q. Jan.	126 1/2	127	Union (Hueckleberry) Ry.....	100	2,000,000	2,000,000	—	190	200
Cleveland, Ohio.—Mar 4							Newark N. J.—Mar 4						
Acron, Ed. & Cle. Elec. Ry.....	100	1,000,000	1,000,000	1% Jan.	48	50	Consolidated Traction Co. of N. J..	100	15,000,000	15,000,000	—	61	62
Cleveland City Ry.....	100	8,000,000	7,800,000	5-5% Jan.	102	102 1/2	North Jersey Railway Co.....	100	6,000,000	6,000,000	—	24 1/2	25
Cleveland Electric Ry.....	100	12,000,000	12,000,000	1% Q. Oct. '90.	88	84 1/2	United Elec. Co. of New Jersey..	100	804,000	804,000	1 1/2% A.	22	24
Detroit, Mich.—Mar 4							Pittsburg, Pa.—Mar 4						
Detroit Citizens' Street Ry.....	100	2,000,000	1,200,000	—	100 1/2	—	Allegheny Traction Co.....	50	500,000	100,000	—	27	28
Fl. Wayne & Belle Isle Ry.....	100	1,000,000	1,000,000	—	175	—	Consolidated Traction Co. com.	50	15,000,000	15,000,000	2% Jan.	15 1/2	26
Rapid Railway Co.....	100	350,000	250,000	—	90	100	Consolidated Traction Co. pfid.	50	9,478,850	—	8% Nov.	75	76
Detroit Electric Railway.....	100	1,000,000	1,000,000	—	100	—	Central Traction Co.....	50	1,800,000	—	1 1/2% Nov.	72 1/2	74
Windsor & Detroit River Ry.....	100	250,000	200,000	—	100	110	Quincy Traction Co.....	50	8,000,000	—	6% A.	72 1/2	73 1/2
Dayton O.—Mar 4							Duquesne Traction Co.....	50	8,000,000	—	6% A.	—	—
City Railway Co.....	100	1,500,000	1,470,000	1% Q.	140	145	Pittsburg Traction Co.....	50	2,500,000	—	8% S. Nov.	—	—
City Railway Co. pfid.....	100	600,000	600,000	1% Q.	170	—	Federal St. & Pleasant Valley Ry..	25	1,400,000	—	2% S. July	27	29
People's Street Railway.....	100	1,100,000	1,100,000	—	114	115	Pgh., Allegheny & Man. Trac. Co..	50	8,000,000	—	2% Aug.	—	—
							Pittsburg & Birmingham Trac. Ry..	25	1,800,000	—	1% Oct.	41	40 1/2
							Pittsburg & West End Ry.....	50	8,000,000	—	5% A. June	—	—
							United Traction Co.....	50	17,000,000	—	J. & J.	15	15 1/2
							United Traction Co.....	50	8,000,000	—	J. & J.	60 1/2	51

* Unlisted. † Ex-div.
 a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.
 b Leased to Boston Elevated Railroad Company.
 c Owned by Brooklyn Rapid Transit Company.
 d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
 e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
 f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
 g Owned by Atlantic Ave. RR. and leased to Nassau system.
 h \$30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; \$200 100 of stock owned by North Chicago Street Railroad Company.
 i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
 j \$5 per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,100 of stock owned by West Chicago Street Railroad Company.
 k Majority of stock owned by Chicago West Division Railway Company; 5% on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
 l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex-div.
 a Leased to New Orleans Traction Company at 5% on stock.
 b Leased to New Orleans Traction Company at 8% on stock.
 c Leased to Central Crotona Railroad at 8% on stock and interest on bonds.
 d Operating the former Met. Trac. system, that corporation having become extinct.
 e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
 f Leased to Houston, West Street & Poyonia Ferry—now Metropolitan Street Railway.
 g Leased to Metropolitan Street Ry. at 8% on stock until Oct. 1, 1897; thereafter 9%.
 h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1895, at \$215,000 per annum.
 i Leased to Met. St. Ry. for 99 years from April 20, 1892; 6% first 5 years, 8% thereafter.
 j Leased to Metropolitan Street Railway for \$145,000 per annum.
 k Leased to Metropolitan Street Railway for 18% on capital stock.
 l Controlled by Third Avenue Railroad by purchase.
 m Dividends of 1 1/2% yearly guaranteed by Consolidated Traction Company.
 n Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.
 o Leased to Consolidated Traction Company for 8% per annum on par value of stock.
 p Leased to Fort Pitt Traction Company for 6% on \$8,000,000 capital stock.
 q Leased to Consolidated Traction Company for 4% on capital stock.
 r Leased to Consolidated Traction Company for 7% on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Capital Stock.		Rate and Date of Last Div.	Eld.	Asked.	NAME.	Capital Stock.		Rate and Date of Last Div.	Eld.	Asked.
	Par	Authorized Issued.					Par	Authorized Issued.			
New Bedford Mass. —Mar 4						Boston, Mass. —Mar 4					
Union Street Railway Co.....	100	800,000	800,000	2 %	Feb.	American Tel. & Tel. Co.....	100	80,000,000	28,650,000	4 1/2 %	Q. Jan.
Northampton, Mass. —Mar 4						Eric Telephone & Telegraph Co.....	100	10,000,000	10,000,000	1 1/2 %	Q. Feb. 20
Northampton Street Ry.....	100	800,000	225,000	4 %	A., June.	New England Telephone Co.....	100	10,894,800	10,804,800	6 L. 50 p. sh.	Feb
Omaha, Neb. —Mar 4						New York. —Mar 4 :					
Omaha Street Ry.....	100	5,000,000	5,000,000	8 %	A. and N.	American Telegraph & Cable Co.....	100	14,000,000	14,000,000	1 1/2 %	Q.
Paterson, N. J. —Mar 4						*Central & South Am. Tel. Co.....	100	5,500,000	5,500,000	1 1/2 %	Q.
Paterson Ry. Co.....	100	1,250,000	1,250,000	.....	.....	*Commercial Cable Co.....	100	10,000,000	10,000,000	1 1/2 %	Q.
Providence, R. I. —Mar 4 :						Franklin Tel. Co.....	100	1,000,000	.....	1 1/2 %	Q.
United Traction & Electric Co.....	100	8,000,000	8,000,000	1/2 %	Oct. '98	Eric Telephone & Telegraph Co.....	100	5,000,000	4,800,000	1 1/2 %	Q. Feb.
Philadelphia. —Mar 4						*Gold & Stock Tel. Co. guar. 6 %	100	5,000,000	.....	1 1/2 %	Q.
Fairmount Park Trans. Co.....	50	2,000,000	1,770,000	2 %	Dec. '98	*International Ocean Tel. Co. guar. 6 %	100	2,000,000	.....	1 1/2 %	Q.
Hestonville, Man. & Fairmount.....	50	1,966,100	1,966,100	2 1/2 %	July 15, '99	*New York & New Jersey Tel. Co.	100	5,000,000	3,728,000	2 1/2 %	Q. Jan.
Hestonville, Man. & Fairmount.....	50	538,900	538,900	2 %	Aug. 1, '99	*Pacific & Atlantic Tel. Co. guar. 4 %	25	2,000,000	.....	2 %	Q.
Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	8 %	Feb. 1, '99	*Postal Telegraph Cable Co.....	100	15,000,000	15,000,000	1 1/2 %	Q.
Union Traction Co.....	50	80,000,000	29,980,450	8 %	Feb. 1, '99	*South & Atlantic Tel. Co. guar. 5 %	25	950,000	559,525	2 1/2 %	Q.
Electric Traction Co.....	50	800,000	8,297,920	.....	.....	*Commercial Union Telegraph Co.	25	500,000	500,000	2 1/2 %	Q. Jan. '99
*Citizens' Passenger Ry.....	50	800,000	1,975,000	1 1/2 share	Q.	Western Union Telegraph Co.	100	97,870,000	.....	1 1/2 %	Q. Jan. '99
*Frankford & Southwark Pass. Ry.	50	1,000,000	1,975,000	1 1/2 share	A—Apr 98	*Div. guar. by Postal Tel. Co.	100	.....	.....	.....	.....
*Lehigh Avenue Ry. Co.....	50	1,000,000	1,000,000	A. & O.	.....	Miscellaneous. —Mar 4					
*Lombard & South Street Ry.	50	1,000,000	1,000,000	8 %	Mar. 98	American Dist. Tel. (Phila.).....	25	400,000	.....	1 1/2 %	Q.
*Second & Third Streets Ry.	50	1,000,000	1,000,000	8 %	Apr. 1898	Bell Teleph. Co. (of Canada).....	100	8,960,000	8,564,000	2 1/2 %	Q.
*People's Traction Co.....	50	10,000,000	16,000,000	8 %	Apr. 1898	Chesapeake & Potomac Tel. Co.	100	.....	.....	.....	.....
*Germantown Passenger Ry.....	50	1,500,000	1,500,000	8 %	Jan. 1898	Chicago Telephone Co.....	100	.....	.....	.....	.....
*Green & Coates Passenger Ry.	50	1,500,000	1,500,000	8 %	Jan. 1898	Central Dist. Prtg. & Tel. Co. (Phg.)	100	750,000	750,000	.....	.....
*People's Passenger Ry.....	50	1,500,000	1,500,000	8 %	Jan. 1898	Empire & Bay States Telegraph Co.	100	2,000,000	2,000,000	1 1/2 %	Q.
*People's Passenger Ry.....	50	1,500,000	1,500,000	8 %	Jan. 1898	Hudson River Telephone Co.....	100	2,000,000	2,000,000	2 1/2 %	Q.
*Philadelphia Traction Co.....	50	80,000,000	130,000,000	2 p. sh.	Oct. 98	*Northwestern Telegraph Co. guar.	50	2,500,000	2,500,000	2 1/2 %	Q.
*Catherine & Bainbridge Sts.	50	1,000,000	1,000,000	8 %	Mar. '98	Providence (R. I.) Tel. Co.....	50	8,000,000	.....	.....	.....
*Continental Pass. Ry. guar.	50	1,000,000	1,000,000	8 %	July '98	Southern New Eng. Tel. Co.....	100	8,000,000	.....	.....	.....
*Empire Passenger Ry. Co.	50	1,000,000	1,000,000	8 %	July '98						
*Philadelphia City Pass. Ry.	50	1,000,000	1,000,000	8 %	July '98						
*Philadelphia & Gray's Ry. RR.	50	1,000,000	1,000,000	8 %	July '98						
*Ridge Avenue Passenger Ry.	50	1,000,000	1,000,000	8 %	July '98						
*Philadelphia & Dart. Ry. guar.	50	1,000,000	1,000,000	8 %	July '98						
*17th & 19th Sts. Pass. Ry. guar.	50	1,000,000	1,000,000	8 %	July '98						
*Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	1,000,000	8 %	July '98						
*Union Passenger Ry. Co.	50	1,000,000	1,000,000	8 %	July '98						
*West Philadelphia Pass. Ry.	50	1,000,000	1,000,000	8 %	July '98						
Rochester, N. Y. —Mar 4											
Rochester Railway Co.....	100	5,000,000	5,000,000	.....	.....						
Reading, Pa. —Mar 4											
Reading Traction Co.....	100	1,000,000	1,000,000	.....	.....						
*City Passenger Ry.....	50	850,000	850,000	.....	.....						
*East Reading Electric Ry.....	50	1,000,000	1,000,000	.....	.....						
St. Louis Mo. —Mar 4											
Fourth Street & Arsenal Ry.....	50	800,000	150,000	.....	.....						
Jefferson Avenue Ry. Co.....	50	400,000	400,000	2 %	Dec. 1898						
Lindell Ry.....	100	2,500,000	2,400,000	1 1/2 %	Jan. '99						
National Railway Co.....	100	2,500,000	2,479,000	1 1/2 %	Jan. '99						
Cass Avenue & Fair Grounds.....	100	2,500,000	2,500,000	.....	.....						
Citizens' RR.....	100	2,000,000	1,500,000	4 %	Oct. '98						
St. Louis RR.....	100	2,000,000	2,000,000	2 1/2 %	Jan. '99						
Missouri RR.....	50	2,400,000	2,800,000	1 1/2 %	Jan. '99						
People's RR. Co.....	50	1,000,000	800,000	50c.	Dec. '98						
United Electric Ry.....	50	500,000	500,000	.....	.....						
United Electric Ry.....	50	1,000,000	1,000,000	8 %	Jan. '99						
St. Louis & Suburban Ry.....	100	2,500,000	2,500,000	8 %	Jan. '99						
Union Depot RR.....	100	4,000,000	4,000,000	8 %	A., July '99						
San Francisco, Cal. —Jan.											
California St. Cable RR.....	100	1,000,000	800,000	50c.	monthly.						
Geary Street Park & Ocean RR.....	100	1,000,000	875,000	32.50	share, '98						
Market Street Ry.....	100	18,750,000	18,750,000	Q.	60c. per share.						
Presidio & Ferries RR.....	100	1,000,000	550,000	.....	.....						
Scranton Pa. —Mar 4											
Scranton Railway Co.....	50	6,000,000	2,500,000	.....	.....						
Scranton & Carbondale Trac. Co.	50	500,000	500,000	.....	.....						
Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	.....	.....						
Springfield Ill. —Mar 4 :											
Springfield Consolidated Ry.....	100	750,000	750,000	.....	.....						
Springfield O. —Mar 4											
Springfield Street Ry.....	100	1,000,000	1,000,000	.....	.....						
Springfield, Mass. —Mar 4 :											
Springfield Street Ry.....	100	1,200,000	1,166,700	4 %	A.						
Toronto Canada. —Mar 4											
Toronto Street Ry.....	100	6,000,000	6,000,000	1 1/2 %	Q.						
Montreal Street Railway Co.....	100	4,000,000	4,000,000	4 %	Q.						
Washington, D. C. —Mar 4 :											
Belt Ry. Co.....	50	500,000	500,000	.....	.....						
Capital Traction Co.....	100	12,000,000	12,000,000	65c.	per sh. Oct. 98						
Columbia Ry. Co.....	50	400,000	400,000	6 %	A.						
Exington & Soldiers' Home Ry.....	50	707,000	652,000	.....	.....						
Georgetown & Tenallytown Ry.....	50	200,000	200,000	.....	.....						
Metropolitan RR. Co.....	50	1,000,000	452,900	2 1/2 %	Q.						
Worcester, Mass. —Mar 4											
Worcester Traction Co.....	100	8,000,000	8,000,000	.....	.....						
Worcester Traction Co.....	100	2,000,000	2,000,000	8 %	Q. Feb.						
Worcester & Suburban Street Ry.....	100	550,000	542,500	4 1/2 %	1898						
Wilkesbarre, Pa. —Mar 4											
Wilkesbarre & Wyoming Val Trac.	100	5,000,000	5,000,000	1 %	Jan.						

* Unlisted. † Paid in. ‡ Full paid. § Outstanding. ¶ Ex-div.
 a Leased to Hestonville, Man. & Fairmount Passenger Ry. for 6 % on stock per annum
 b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
 c Practically all shares owned by Union Traction Company.
 d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
 e Leased to Electric Traction Company.
 f Controlled by Frankford & Southwark Passenger Railway.
 g Leased to People's Passenger Railway at \$5 per share.
 h Majority of stock owned by People's Traction Company.
 i Leased to Union Traction Company.
 j Lease transferred to Union Traction Company.
 k Leased to United Traction Company at a rental of \$10,000 per annum in 1866-7-8; \$20,000 in 1899-1900 and \$30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.
 l Dividend of 10 % guaranteed by Reading Traction Company.
 m Dividend of 6 % guaranteed by Reading Traction Company.
 n Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

ELECTRIC LIGHT AND ELECTRIC MFG. COS.

Boston, Mass. —Mar 4																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
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BONDS.

PASSENGER RAILWAY.

NAME.	Amount. Authorized.	Amount. Issued.	Due	Interest periods.	Rtd.	Asked.
Albany N. Y.						
<i>Date of Quotation—Mar 4, 1901</i>						
The Albany Ry. Co. Cons. mtg. 5s.	\$500,000	427,500	1940	J. & J.	117%	.....
The Albany Ry. Co. Gen. mtg. 5s.	750,000	575,000	1947	M. & N.	116%	.....
Watervliet Turnpike & RR. 1st mtg. 6s.	850,000	850,000	1919	M. & N.	112%	.....
Watervliet Turnpike & RR. 2d mtg. 6s.	150,000	150,000	1919	M. & N.	112%	.....
Troy City Railway Co. 1st mtg. 5s.	.....	.....	1942	.....	114	116%
Interest guar. by Albany Ry. Co. Principal and interest guar. by Albany Ry. Co.						

Baltimore Md.						
<i>Date of Quotation—Mar 4, 1901</i>						
United Electric Ry. Co. 1st mtg. g. 4s.	88,000,000	18,000,000	1949	M. & S.	102	102%
..... Income 4s.	14,000,000	.....	1949	J. & D.	74%	75
Baltimore City Pass. Ry. 1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118%	.....
Baltimore Traction Co. 1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
Baltimore Trac. Co. Exten. & Imp. g. 5s.	1,250,000	1,250,000	1901	M. & S.	104%	.....
Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s.	1,750,000	1,750,000	1942	J. & D.	121	121%
Bal. Trac. Co. Coll. Trust 1st mtg. g. 5s.	750,000	.....	1900	J. & J.	101	.....
Baltimore Traction Co. Convertible 5s.	800,000	.....	1906	N. & M.	102%	.....
Central Pass. Ry. Co. 1st mtg. 6s.	95,000	117,000	1912	J. & J.	.....	.....
Central Pass. Ry. Co. Cons. mtg. g. 5s.	604,000	580,000	1932	M. & N.	119	121
City & Suburban Ry. 1st mtg. g. 5s.	8,000,000	8,000,000	1922	J. & D.	116	117
Lake Roland Elev. 1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	.....

All of the bonds of the above companies, marked f, have been assumed by the United Railways & Electric Company.

Boston Mass.						
<i>Date of Quotation—Mar 4, 1901</i>						
Lynn & Boston RR. 1st mtg. g. 5s.	5,379,000	3,702,000	1924	J. & D.	114	115
West End Street Ry. Deben. g. 5s.	8,000,000	.....	1902	M. & N.	104%	106
West End Street Ry. Deben. g. 4 1/2s.	2,000,000	2,000,000	1914	M. & S.	112	.....
f \$1,974,000 in escrow to retire outstanding bonds of absorbed companies.						

Charleston S. C.						
<i>Date of Quotation—Mar 4, 1901</i>						
Enterprise Street RR. 1st mtg. 5s.	500,000	47,000	1906	J. & J.	.....	.....
Charleston City Ry. 1st mtg. 6s.	850,000	.....	.....	J. & J.	106	.....
f Controlled by Charleston St. Ry. Co.						

Chicago Ill.						
<i>Date of Quotation—Mar 4, 1901</i>						
Chicago City Ry. 1st mtg. 4 1/2s.	6,000,000	4,619,500	1901	J. & J.	101%	2%
Chicago Passenger Ry. 1st mtg. 6s.	400,000	400,000	1908	F. & A.	.....	103
Chicago Passenger Ry. Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	.....	.....
Chicago & So. Side R. T. 1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	.....	.....
Chicago & So. Side R. T. 2d mtg. g. 5s.	1,500,000	750,000	1907	J. & J.	.....	.....
Chicago West Div. Ry. 1st mtg. 4 1/2s.	4,040,000	4,040,000	1932	J. & J.	108%	109
Lake Street Elevated RR. 1st mtg. g. 5s.	7,574,000	8,781,200	1928	J. & J.	.....	.....
Metrop. W. Side Elev. Ry. 1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	95	96%
North Chicago St. RR. 1st mtg. 5s.	8,171,000	8,171,000	1906	J. & J.	106	.....
North Chicago St. RR. Cert. Indeb. 6s.	500,000	500,000	1911	J. & J.	.....	.....
North Chicago City Ry. 1st mtg. 6s.	500,000	500,000	1900	J. & J.	.....	.....
North Chicago City Ry. consol. 4 1/2s.	2,500,000	2,500,000	1927	M. & N.	108	.....
West Chicago St. RR. 1st mtg. 5s.	4,100,000	8,989,000	1928	M. & N.	.....	111
West Chicago St. RR. Deben. 6s.	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR. Cons. mtg. g. 5s.	12,500,000	6,000,000	1936	.....	108%	107
W. Chicago St. RR. Tunnel. 1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	.....	.....
f Redeemable at option on 60 da. notice. f Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee. f Subject to call after Oct. 1, 1899, at 110 and interest. f Assumed by W. Chi. RR. Co., lessee. f Int. guar. by W. Chicago St. RR. Co.						

Cincinnati, O.						
<i>Date of Quotation—Mar 4, 1901</i>						
Qtn. New & Cov. St. Ry. 1st Cons. mtg. g. 5s.	8,000,000	2,500,000	1922	J. & J.	114%	115
Mt. Adams & Eden Pk In. 1st mtg. 6s.	46,000	46,000	1900	A. & O.	108%	104
Mt. Adams & Eden Pk In. 2d mtg. 6s.	100,000	100,000	1905	A. & O.	114	.....
So. Cov. & Otn. St. Ry. 1st mtg. 6s.	531,090	581,000	1906	M. & S.	108%	.....
So. Cov. & Otn. St. Ry. 2d mtg. 6s.	250,000	250,000	1912	M. & S.	121%	122%
Jo. Cov. & Otn. St. Ry. 2d mtg. 6s.	400,000	400,000	1932	J. & J.	182%	187
f Assumed by the Cincinnati St. Ry. Co. f \$250,000 reserved to retire 1st mtg. bds.						

Cleveland O.						
<i>Date of Quotation—Mar 4, 1901</i>						
Brooklyn Street RR. Co. 1st mtg. 6s.	600,000	600,000	1908	M. & S.	106%	107
Cln. New't & Cov. St. Ry. Cons. mtg. 5s.	8,000,000	2,500,000	1922	J. & J.	118%	114%
Cleveland City Cable Ry. 1st mtg. 6s.	2,000,000	2,000,000	1909	J. & J.	105	106
Cleveland Electric Ry. Co. 1st mtg. g. 5s.	8,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry. 1st mtg. g. 5s.	1,500,000	1,500,000	1910	M. & N.	.....	.....
East Cleveland RR. 1st mtg. 5s.	1,000,000	1,000,000	1918	M. & S.	107%	.....
Fl. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	600,000	.....	1922	M. & N.	.....	.....
Lorain (O.) Street Ry. 1st mtg. 6s.	200,000	200,000	1915	J. & J.	.....	.....
St. Ry. Co. Grand Rapids. 1st mtg. 5s.	600,000	600,000	1912	J. & D.	.....	.....
f \$1,000,000 in escrow to retire bonds of absorbed companies, marked a. Interest guar. by Cons. St. Ry. Co.						

Detroit, Mich.						
<i>Date of Quotation—Mar 4, 1901</i>						
Detroit Citizens' St. Ry. 1st mtg. 5s.	7,000,000	8,885,000	1905	A. & O.	.....	102%
Fl. Wayne & Belle Isle Ry. 1st mtg. 6s.	400,000	877,000	1902	A. & O.	.....	.....
The Detroit Ry. 1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106%
f \$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.						

New Haven Conn.						
<i>Date of Quotation—Mar 4, 1901</i>						
New Haven St. Ry. 1st mtg. g. 5s.	600,000	600,000	1918	J. & D.	111	.....
New Haven (Bridgeport Div.) 1st mtg. 5s.	250,000	250,000	1914	J. & D.	111	.....
Windsor Avenue RR. 1st mtg. g. 5s.	100,000	600,000	1913	M. & N.	109	.....
Windsor Avenue RR. Deben. g. 5	100,000	34,000	1913	M. & S.	.....	.....

PASSENGER RAILWAY.

New Orleans La.						
<i>Date of Quotation—Mar 4, 1901</i>						
Canal & Claiborne RR. Cons. mtg. 6s.	\$150,000	\$150,000	1912	M. & N.	.....	.....
Orescent City RR. 1st mtg. 6s.	.....	50,000	1896	M. & N.	105%	.....
Orescent City RR. Cons. mtg. g. 5s.	5,000,000	8,000,000	1948	J. & J.	.....	.....
New Orleans City RR. 1st mtg. 6s.	416,500	899,000	1908	J. & D.	108	112
N. Or. City & Lake RR. 1st mtg. g. 5s.	5,000,000	2,699,500	1948	J. & J.	112	118
N. Orleans & Carrollton RR. 2d mtg. g. 5s.	800,000	800,000	1907	F. & A.	.....	.....
Orleans Railroad Co. Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	.....	.....
St. Charles St. RR. Co. 1st mtg. 6s.	800,000	75,000	1908	J. & D.	.....	.....
f \$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds. f \$90,000 outstanding.						

New York.						
Date of Quotation—Mar 4, 1901.						
Atlantic Ave. (Brooklyn).....Imp. g. 5s.	1,500,000	1,500,000	1984	J. & J.	95	.....
Atlantic Av. (Brooklyn) 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	103%	110
Atlantic Av. (Brooklyn) Cons. mtg. 5s.	8,000,000	1,966,000	1981	A. & O.	115	116
Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1948	J. & D.	128	128
Bro'dway & 7th Ave.....1st mtg. 5s.	1,800,000	1,600,000	1904	J. & D.	104	104%
Bro'dway & 7th Ave.....2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Bro'dway Surface.....1st mtg. 5s.	1,125,000	1,125,000	1924	.....	115	117
Bro'dway Surface.....2d mtg. 5s.	1,000,000	1,000,000	1905	.....	108	108
Brooklyn City RR. Co. 1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown.....1st mtg. 5s.	2,000,000	2,000,000	1989	J. & J.	115	116
Brooklyn Bath & W. E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR.....1st mtg. 5s.	250,000	250,000	1941	A. & O.	104	.....
Brooklyn, Q's Co. & Sub'n. 1st mtg. 5s.	8,500,000	8,800,000	1941	J. & J.	112	.....
Brooklyn, Q's Co. & Sub'n. 1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	.....
Brooklyn Rapid Transit.....gold 5s.	7,000,000	5,181,000	1945	.....	109%	100%
Bleecker St. & Fulton Ferry RR. 1st mtg. 7s	700,000	700,000	1900	.....	94%	100%
Cent Pk, N. & E. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Crostown RR.....1st mtg. 6s.	250,000	250,000	1922	M. & N.	125	.....
Coney Island & Brooklyn RR. 1st mtg. 5s.	800,000	800,000	1908	J. & J.	101	108
D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s.	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. Bd'y & Bat'y RR. scrip 5 1/2s.	100,000	1,100,000	1914	F. & A.	102	106
Elgin Av. RR. Co. Cert. Indeb. 6 1/2s.	000,000	1,000,000	1914	F. & A.	108	.....
42d St. Man. & St. Nich. Av. 1st mtg. 6s.	200,000	1,200,000	1910	M. & S.	116%	117
42d St. Man. & St. N. Av. 2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	.....
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1938	M. & S.	124	125
Metropolitan St Ry Co. g. m. cl. tr. g. 5s.	12,500,000	12,500,000	1907	F. & A.	120	.....
Second Avenue Ry. Gen. cons. mtg. 5s.	1,600,000	1,000,000	1909	M. & N.	120	121
Second Avenue Ry. Deb. 5s.	800,000	800,000	1909	J. & J.	108%	109
Steinway Ry. (L. I.).....1st mtg. g. 6s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co. 1st mtg. 5s.	850,000	850,000	1919	.....	110%	112%
Third Avenue RR.....1st mtg. g. 5s.	5,000,000	5,000,000	1937	J. & J.	.....	128%
Twenty-third Street Ry. 1st mtg. 6s.	.....	.....	1909	J. & J.	.....	.....
Twenty-third Street Ry. Deb. 5s.	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry. 1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A.	118	116
Westchester Electric RR. 1st mtg. 5s.	500,000	500,000	1948	J. & J.	110	114

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	RM.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation - Mar 4 19 1						
Jefferson Avenue Ry.....1st mtg. 5c.	400,000	400,000	1908	M. & N.	108	106
Lindell Ry. Co.....1st mtg. 5c.	1,500,000	1,500,000	1911	F. & A.	108	109
Missouri RR. Co.....1st mtg. 5c.	1,000,000	700,000	1916	M. & N.	105	106
Mount City RR. Co.....1st mtg. 5c.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co.....1st mtg. 5c.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 7c.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 5c.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric 1st mtg. 5c.	75,000	75,000	1908	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 5c.	2,000,000	2,000,000	1900	M. & N.	99%	100%
St. Louis & Sub. Ry.....1st mtg. 5c.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5c.	800,000	800,000	.....	.....	80	84
Southern Electric Ry.....Cons. mtg. 5c.	500,000	500,000	1909	M. & N.	106	108
Taylor Avenue St. Ry.....1st mtg. 5c.	500,000	500,000	1912	J. & J.	116	118
Union Depot RR. Co.....1st cons. mtg. 5c.	1,091,000	1,091,000	1900	A. & O.	100	100%
Union Depot RR. Co.....Cons. mtg. 5c.	6,500,000	1,787,000	1912	J. & J.	121	122
†Controlled by St. Louis RR. Co.						
†Controlled by Union Depot RR. Co.						
†Controlled by Lindell RR. Co.						
†\$200,000 in escrow to retire 1st & 2d mtg.						
†\$500,000 in escrow.						
†\$200,000 in escrow to retire 1st mtg.						
sds.						
San Francisco Cal.						
Date of Quotation - Mar 4 1901						
California St. Cable RR.....1st mtg. 5c.	1,000,000	900,000	1915	J. & J.	114	117
Ferries & Cliff House Ry.....1st mtg. 5c.	650,000	650,000	1914	M. & N.	.....	117
Geary St. Park & Ocean RR.....1st mtg. 5c.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. 5c.	8,000,000	8,000,000	1912	J. & J.	120%	.....
Metropolitan Ry. Co.....1st mtg. 5c.	200,000	.....	.....	.....	.....	.....
Omnibus Cable Co.....1st mtg. 5c.	2,000,000	2,000,000	1918	A. & O.	125%	.....
Park & Cliff House RR.....1st mtg. 5c.	850,000	850,000	1912	J. & J.	105%	107
Park & Ocean RR.....1st mtg. 5c.	250,000	250,000	1914	J. & J.	115	.....
Powell St. Ry.....1st mtg. 5c.	700,000	700,000	1912	M. & N.	.....	125
Butter St. Ry. Co.....1st mtg. 5c.	1,000,000	900,000	1912	M. & N.	.....	.....
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation - Mar 4 1901						
Balt Ry. Co.....Cons. mtg. 5c.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 5c.	500,000	800,000	1914	A. & O.	125	.....
Exington & Soldiers' Home.....1st mtg. 5c.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 5c.	900,000	600,000	1901	J. & J.	.....	.....
†\$50,000 in escrow to retire 1st mtg. bds.						
Miscellaneous						
Date of Quotation - Mar 4 1901						
Bridgeport Traction Co.....1st mtg. 5c.	2,000,000	1,688,000	1922	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 5c.	5,000,000	8,548,000	1961	F. & A.	118	.....
Wisconsin St. R. (Ind. pols.) 1st cons. m. 5c.	4,000,000	8,000,000	1922	M. & N.	104	105
Orestown St. Ry. (Buffalo) 1st mtg. 5c.	8,000,000	2,856,000	1922	M. & N.	112	118
Columbus (O.) St. Ry.....1st cons. 5c.	8,000,000	2,261,000	1922	J. & J.	118	.....
Consolidated Traction (N. J.) 1st mtg. 5c.	15,000,000	13,968,000	1922	J. & D.	111%	111%
Orest St. Ry. (Colo.) 1st mtg. 5c.	2,000,000	572,000	1920	J. & D.	115	115%
Denver City Cable Ry.....1st mtg. 5c.	4,000,000	8,800,000	1920	J. & J.	20	.....
Denver City Cable Ry.....Cons. m. 5c.	4,000,000	922,000	1922	A. & O.	80	85
Louisville (Ky.) Ry.....1st cons. mtg. 5c.	6,000,000	4,981,000	1920	J. & J.	119	119%
Minneapolis St. Ry. 1st cons. mtg. 5c.	5,000,000	4,050,000	1919	J. & J.	110%	110%
No. Hudson Co. Ry. (N. J.) Cons. mtg. 5c.	8,000,000	2,878,000	1922	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.) 2d mtg. 5c.	550,000	550,000	1922	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.) Deb. 5c.	500,000	489,000	1902	F. & A.	.....	.....
Paterson (N. J.) Ry.....Cons. mtg. 5c.	1,250,000	1,000,000	1921	J. & D.	.....	.....
Manchester (N. Y.) Ry.....1st mtg. 5c.	8,000,000	2,000,000	1920	A. & O.	.....	.....
St. Paul City Ry.....Cons. 5c.	5,500,000	4,298,000	1927	.....	105%	106
St. Paul City Ry.....Deb. 5c.	1,000,000	1,000,000	1900	.....	108	.....
†\$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
†\$500,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
†\$750,000 in escrow to retire bonds of O. St. RR. Co.						
†\$50,000 in treasury.						
†\$200,000 reserved to redeem prior liens						
†\$250,000 in escrow.						
With Int'r						

*With int' res

ELECTRIC LIGHT AND ELECTRIC MFG. COOS

Boston, Mass.						
Date of Quotation - Mar 4 1901						
Delaware Gas Lt. Co.....1st m. 5c. g.	800,000	800,000	.....	J. & J.	108	108
Edison Elec. Illuminating Co., Boston...	2,028,000	.....	.....	Quar.	157	.....
General Electric Co. gold coup. deb. 5c.	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa.						
Date of Quotation - Mar 4 1901						
Allegheny County Light Co.....5c.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Scrip 5c.	195,570	.....	.....	M. & N.	.....	.....
Miscellaneous. - (Mar 4 1901.)						
Edison El. Ilig. Co. (N. York) 1st m. 5c.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilig. Co. (N. Y.) con. m. 5c.	15,000,000	2,188,000	1928	.....	124	.....
Edison Elec. Ilig. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122%	124
Edison Electric Light (Philadelphia)...	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5c.	2,500,000	.....	1927	A. & O.	100	105
Kings Co. El. Lt. & Pow. Co. pur. money 5c.	5,176,000	.....	1927	A. & O.	120	122
Milwaukee El. Ry. & Lt. Co. 1st con. 5c.	8,000,000	.....	.....	F. & A.	102%	.....
United Elec. Light & Power Co. (N. Y.)...	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation - Mar 4 1901						
American Bell Telephone.....4c.	.....	.....	1908	F. & A.	100%	101
Northwestern Telegraph Co.....7c.	.....	.....	.....	.....	.....	.....
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 5c.	.....	.....	.....	.....	114	115
Chesapeake & Potomac Teleph. Co.....5c.	.....	.....	1911	J. & D.	108	108

ALLIED INDUSTRIES.

Miscellaneous						
Date of Quotation - Mar 4 1901						
American Electric Heating.....7c.	500,000	500,000	.....	.....	.....	25
Armington & Sims Engine Co.....	.....	.....	.....	.....	.....	.....
Barnes & Smith Car Co.....5c.	.....	.....	1942	J. & J.	106	107
Cambridge Mfg. Co.....5c.	.....	.....	1904	J. & D.	.....	.....
Worthington Pump Co.....	75,000	.....	.....	.....	115	127
Valued						
Nominal						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16¾c.; Lake, 16½@17c.; casting, 16½@16¾c.

Thomas F. Ryan was elected a director of the Chicago Union Elevated Railroad Company on Saturday.

The Chicago City Railway Company has declared a dividend of 3 per cent. payable March 30. Books close March 14 and reopen March 22.

Stockholders of record on the books of the Columbus Edison Company to-day have the right to subscribe for 6¼ per cent. additional preferred stock at par. "Rights" expire March 15.

The Electric Storage Battery Company of Philadelphia has declared quarterly dividends of 1¼ per cent. each on its common and preferred stocks, payable April 1. Books close March 26 and reopen April 2.

The Chicago Telephone Company has declared the regular quarterly dividend of 3 per cent., payable March 30. Books close March 27 and reopen April 9.

A movement is said to be on foot for consolidating the independent telephone companies of Western Maryland, Pennsylvania, Virginia and West Virginia, and for establishing a long distance service to New York, Philadelphia and Baltimore.

The annual report of the General Electric Company will be ready about the middle of April. Directors will presumably meet for dividend early this month when it is expected they will declare something better than 2 per cent. for the quarter.

At the annual meeting on February 28 of the Chesapeake & Potomac Telephone Company, which operates in Washington, Baltimore and other Southern cities, the retiring board of directors was re-elected. No financial statement was issued.

At a special meeting of the stockholders of the New York & New Jersey Telephone Company in Brooklyn last Friday it was voted to increase the capital stock from \$8,000,000 to \$15,000,000. The new stock will be offered to present shareholders as it is needed for the improvements of the company.

A special meeting of the stockholders of the International Automobile & Vehicle Tire Company will be held at 243 Washington street, Jersey City, N. J., to-day to take action toward reducing the capital stock. It is proposed to reduce the preferred stock from \$1,500,000 to \$500,000, and of the common stock from \$1,500,000 to \$500,000. Stockholders will also consider the issue of mortgage or debenture bonds.

The annual meeting of the Canadian Bell Telephone Company was held at the head office of the Company at Montreal on the 28th of February. The item of particular interest in the annual report was the fact that an increase of capital, from \$5,000,000 to \$10,000,000, is contemplated. The present capital has all been issued and additional money is required for construction and general extensions. An additional bond issue of \$2,550,000 has also been authorized, and these bonds will be placed upon the market as the funds are required.

The Twin City Rapid Transit Company reports for the year ended December 31 last: Receipts—Passenger earnings, \$2,814,205; miscellaneous, \$25,151; total earnings, \$2,839,356. Expenses—Maintenance, way and structure, \$61,086; maintenance of equipment, \$159,835; operating power plant, \$170,662; car services, \$641,196; general expenses, \$156,472; legal expenses, \$23,000; injuries and damages, \$82,949; insurance, \$9,489; total operating expenses, \$1,304,689. Net earnings, \$1,534,667; interest and taxes, \$624,326. Balance, \$910,341; total dividends, \$655,050; surplus, \$255,291.

The report of the International Power Company for the year 1900 shows that there had been expended during the year in the development of the automobile truck and electric vehicle business \$55,100, from which no profits had been derived, but a very large and lucrative business is anticipated in orders already in prospect. The net surplus over current liabilities amounts to \$190,572, to which is added \$388,755 for betterments, etc., making the gross assets over all liabilities, \$579,327. The profit and loss account as of December 31, 1900, shows a total surplus of \$424,136.

The Lake Shore Electric Railway Company, of Cleveland, O., capital, \$4,000,000, has been formed by the consolidation of the Lorain and Cleveland, the Sandusky Interurban and the Sandusky & Norwalk Southern roads. By this deal a chain of electric roads will extend from Buffalo to Detroit, paralleling the Michigan and Lake Shore Railroad. The entire line will be completed this summer. The equipment of the road will be of the highest standard, and the cars will have a speed of fifty miles an hour over a seventy-pound rail. It is said that none of the stock will be put on the market.

There is some doubt in the minds of the stockholders of the Westinghouse Electric Company as to the manner in which the \$10,000,000 of new stock issue will be allotted. It was felt that the stockholders would be given the privilege of subscribing for the new stock at par, but from the statement made subsequent to the meeting it appears that there is no such intention on the part of the management. The statement in reference to the stock issue is as follows: "To meet the already increased capital requirements of the company, which cannot be cared for from the earnings without hardship to the stockholders, \$3,000,000 of stock, sold at the best possible price, but not less than par, will suffice." As yet the Westinghouse Company has not published the terms of the issue, and the stockholders are anxiously awaiting these terms. In connection with this matter George Westinghouse, president of the company, makes this statement: "If some stockholders should be surprised that more complete statements have not been previously submitted to them, it can only be said that the directors, as well as the stockholders who own the largest amounts of stock, have believed that in view of the existing keen competition and the general attitude toward industrial enterprises, the interests of all would be served by avoiding, to as great an extent as possible, giving undue publicity to the affairs of the company."

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EDITORIAL NOTES.

The Brooklyn Transit Problem.

It is only necessary to be
unfortunate enough to
have to cross from Man-
hattan Island to Brook-
lyn by way of the bridge during the so-called
rush hours to have it most forcibly impressed
upon one the great need of better transit
facilities.

When the great football games between the
leading colleges were played on Manhattan
Field a few years ago the crowds that had to
be handled were something enormous and
taxed to the utmost the carrying capacity of
the elevated roads, yet this condition of affairs
had only to be met once or twice during the
autumn, whereas the mass of workers who
travel to and from their Brooklyn homes by
way of the bridge, has to be handled twice a
day. The only surprising thing is that, under
the circumstances, very serious accidents have
not occurred.

That something will have to be done to
alleviate this congestion of traffic is only too
apparent, and the position that the Chamber
of Commerce has taken is therefore a most
laudable one. Referring to this subject former
Mayor Abram S. Hewitt in an interview says:

"I imagine that what the Chamber of Com-
merce wishes to bring about is a pressure of
public opinion, which will force the authori-
ties at the City Hall to take some action.
There is usually an apathy at the City Hall
which leads those in power to do nothing until
they are forced to act.

"What I suppose is needed at the bridge is
more terminal facilities. That has always
been the case there—partly, I suppose, because
the city was unwilling to pay the price to get
the land."

That better terminal facilities are sorely
needed goes without saying, but what is also
needed is a tunnel under the East River to
Brooklyn.

When the Brooklyn Bridge was first built
the population of Brooklyn was in the neigh-
borhood of 600,000, whereas to-day this figure
has risen to almost 1,200,000. In the same way
the population of Manhattan Borough has in-
creased from 1,000,000 to over 2,000,000. As a
well known writer aptly puts it, the people
have outgrown their bridge, and something
therefore ought to be done. London is admit-
tedly behind New York in many things, but
not in its means for transportation from one

portion of the city to another. The River
Thames, for instance, is spanned by fourteen
street bridges, and in addition has under its
bed four street railways, two operated by elec-
tricity. Against this, progressive New York
has but one bridge to Brooklyn—although it is
true another is in course of construction—and
several antiquated ferry-boats by means of
which almost 100,000 persons are expected to
journey to and from their places of business
and homes in the short space of a couple of
hours. The new East River Bridge when com-
pleted will probably improve the situation
somewhat, but at best but slightly, as it is too
far up-town to relieve the Brooklyn Bridge to
any great extent. What is needed is a tunnel
under the East River to connect with the un-
derground rapid transit system now in course
of construction, and it is to be hoped that the
Rapid Transit Commission will be empowered
to order its construction.

* * *

An Invention for Testing Thermostats.

At the present day in-
numerable buildings are
equipped with ther-
mostats, which give an
alarm usually by the

ringing of a bell, when the temperature rises
above a certain point. There are various
types of thermostats which operate on dif-
ferent principles, although in every case an
electric circuit is completed, usually when the
temperature rises forty degrees Fahrenheit
above the maximum temperature of the
premises. In the early days of thermostats the
principle in which they were made to operate
was through the expansion of metals. For in-
stance, the rise in temperature to a predeter-
mined degree would cause the free end of a
spring to move by expansion and come in con-
tact with a screw point, thereby closing an
electric circuit. Among other principles
made use of in the construction of thermostats
are those employing volatile fluids, fusible
solder and mercury. The last named type is
probably made use of to a greater extent than
any other, and much resembles in general ap-
pearance a thermometer, excepting that at a
given point above the mercury is placed metal-
lic points connected with one pole of a battery
while the mercury itself is connected to the
other pole. Thus when the mercury rises in
the tube and touches the points, the circuit is
completed and the alarm sounded. Heretofore
it has been more or less of a difficult matter to
test these thermostats in order to ascertain if

they are in working order. With a view to facilitating this work an English engineer by the name of Heaphy has perfected a system whereby a source of heat is provided at the thermostat. For this purpose, according to the London "Electrical Engineer," a third wire is run from the indicator board to each thermostat in a building. This wire ends in a coil of high resistance material placed near the bulb of the thermostat. At the indicator board a multiple-way switch enables a six-volt battery to send a current to the resistance coil of any thermostat. The resistance of the circuit is such that the resistance wire is heated only slightly above the temperature at which an alarm is given. With the apparatus in question it only takes about half a minute for the current to bring the mercury in any thermostat up to the alarm temperature, and to complete the circuit. Commenting on the invention our contemporary says:

"We think the idea is an exceedingly good one, and there should be absolutely no difficulty in making the details exceedingly durable. The great advantage of the apparatus is that it not only proves that the mercury contacts within the thermostats are working satisfactorily, but that the wires from the thermostat to the indicator board and alarm bell are also in good condition."

* * *

American Capital in England.

It seems strange that London, the money center of the world, should require American capital to give it up-to-date rapid transit. Such, however, seems to be the case and, according to the N. Y. "Herald," Albert L. Johnson, brother of Tom L. Johnson of street railway fame, is endeavoring to put through two transit projects for the English metropolis, involving respectively \$15,000,000 and \$7,500,000 of American capital.

One of the projects, the first named, is that of the Baker street underground road, which is to run from the Elephant and Castle, in London, to Paddington Station, and be about six miles long. The other plan is for an underground road near the Bank of England to St. George's Circus, which is not far from the Elephant and Castle.

Mr. Johnson, who is now in this city, in a recent interview is reported as saying:

"The franchise for the Baker street road, was one of the assets of the London and Globe Finance Corporation, and the directors some time ago let me have an option on the franchise and the portion of the road which they have built. This option expired one day last week and I have had it renewed for sixty days.

"A syndicate consisting of some of the strongest financial interests of this city, has been formed and is ready to put in the necessary money. My partner, former Representative Benjamin Cable, of Illinois, is now in London looking after our interests, and will probably sail for this country in a few days. When completed, the route will represent a total investment of about \$15,000,000 of capital.

"The starting point of this route is the Elephant and Castle. Thence the road will run northwest to Waterloo Station and under the Thames in the neighborhood of the Charing Cross rail and foot bridge, and then to Charing Cross Station. At the Strand it will turn under

Trafalgar Square and Pall Mall to the Haymarket.

"It will run under the Haymarket to Piccadilly Circus, then under the Quadrant and Regent street, in which the fashionable retail shops are located, and under Langham Place and Portland Place, northwest to Marylebone Road, crossing Baker street, and run as far as the Paddington station, passing Edgware Road Station on the way.

"At one terminus—the Elephant and Castle—we connect with many horse car lines. At the other terminus—Paddington Station—we connect with several steam railway lines. If the horse cars are ever replaced by trolley cars we may tie them up into trains of five cars each at the Elephant and Castle and send them through the tube to Paddington. The route should get all the theater traffic, and carry an army of shoppers and of clerks going to and from their work.

"There are to be two tubes, each eleven and a half feet in diameter. The London and Globe has already completed one of these tubes and has put in several sections of the other. We plan to use electric cars, and carry passengers for twopence a fare. Our stations, besides the terminals, will be at Waterloo Station, Charing Cross, Piccadilly Circus, at Oxford Circus, Baker street and Edgware Road.

"That is one road. Now, I have just received final advices to the effect that I can purchase an option for another underground route from the neighborhood of the Bank of England, in Threadneedle street, S. W., under the Thames just west of the London Bridge to a place called St. George's Circus, which is a very short distance from the section of the other route from the Elephant and Castle to Waterloo Station.

"To purchase this franchise and build the road would cost about \$7,500,000. If we do it we shall aim to get the right to connect both routes below St. George's Circus. The original plan of this second route was to extend it out about four miles beyond St. George's Circus in the direction of Brighton."

It is understood that Mr. Johnson is working independently of Mr. Yerkes, whose underground road however also touches at Charing Cross. If both of these gentlemen succeed in carrying out their ideas and plans, it would seem as though the rapid transit systems of London would be pretty well under American control. No wonder England and European countries are startled by what has been termed American trade and financial invasion!

SANTOS DUMONT is busily conducting experiments with a new airship at Nice, France. He says that he has already built and tried two machines, but neither of them obtained that measure of success for which he hoped. This year the young aeronaut has had a much more powerful machine constructed. The balloon itself is cigar-shaped and is made of the strongest silk. Underneath is suspended the machinery, which rests upon a long and very stout bamboo. The aeronaut sits in the center on a bicycle saddle and pedals the machine bicycle fashion. In front of him is a wheel by turning which he manoeuvres the aluminum screw placed in the front of the machine. As in many other inventions of this nature the motive power is electricity generated by the pedaling, storage batteries being located in front of the steering wheel.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

THE auditorium and drawing rooms of the University of Wisconsin will shortly be lighted by electricity with lamps so placed as to be invisible to persons in the rooms. This is the result of interesting experiments. The lamps will be arranged around the sides of the rooms with opaque reflectors to project the light evenly over dead white ceilings. The ceilings will reflect the light through the rooms, thus furnishing a reflected light of uniform intensity everywhere in the rooms.

It is reported that Signor Marconi is to undertake important electrical experiments in the United States. In an interview last week before he left Liverpool he said his journey had nothing to do with any attempt to establish wireless telegraphy across the Atlantic, but admitted, however, that he expected to meet officials of the Bureau of Equipment of the United States Navy, and that the meeting would perhaps result in some experiments on an American warship.

A DISPATCH from Cleveland, O., says that a funeral procession of trolley cars moved through the East End streets Sunday afternoon, bearing the body of Frank A. Heinline, the dead paymaster of the Consolidated Railway Company, to the Lake View Cemetery. The dispatch says it was in many respects the most remarkable funeral that city has ever seen.

CHRISTOPHER LYMAN MAGEE died at his home in Pittsburg, Pa., last Friday afternoon. Mr. Magee represented Pittsburg in the Pennsylvania Senate and was president of the Consolidated Traction Company of Pittsburg. He was 53 years old and before his illness he had his life insured in favor of his wife for one million dollars.

THOMAS A. EDISON's representative was in Buffalo, N. Y., recently arranging for space to make an exhibit of electrical novelties at the Pan-American Exposition. The display will be made in the Electricity Building and will show all of the recent inventions of Mr. Edison.

FARMERS in the country adjacent to Chicago are taking up the automobile fad. Orders received from rustic purchasers indicate that the country roads in Illinois and Wisconsin this summer will be filled with horseless vehicles.

IN recognition of his achievements in ocean telephony the Columbia University trustees of this city recently promoted Michael Idvorsky Pupin, formerly adjunct professor of mechanics, to a full professorship in electro-mechanics. The office was created especially for him. President Seth Low announced he had selected Prof. Pupin to represent Columbia at the celebration of the 450th anniversary of the University of Glasgow in June.

ELECTRICAL power continues to supersede other power for the operations of yards and works, says an English contemporary. One of the most useful and convenient applications of electricity has been in drilling. Mr. T. Anderson, M. I., M. E., of Liverpool, England, some-

time ago invented a portable drilling machine for electrical power, which has come into large use. The advantages of the machine are its convenience and the speed with which boring is done when the machine is in position. Holes of any size can be drilled or enlarged by the use of it, though the work to be bored be in difficult and almost inaccessible places, such as the tunnels of propeller shafts or in confined engine rooms. Some remarkable boring has recently been done with Anderson's patent boring bar, the appliance for heavy work. Among other things cylinders in position in the White Star steamers Oceanic and Majestic have been bored out by means of it.

PLANS for the conversazione of the American Institute of Electrical Engineers, to be held at Columbia University on April 12, are being developed very vigorously by the committee in charge, and a number of novel and interesting exhibits are promised, as well as some of the first importance. While the affair will be scientific in character, the lighter social side will not be neglected, as provision has already been made for music, collation, etc. The most encouraging feature next to the active interest shown by the members is the desire evinced by prominent inventors and the leading electrical companies to contribute items of intrinsic merit to the list of attractions, and it has been found necessary to impose a limit both as to space and as to time of entry. Lecture rooms 301 and 302, in the Electrical Engineering Department, will be occupied, as well as 306 and 308 in the Mechanical Engineering Department. The elevators will be in service and cloak and dressing rooms provided on the upper floors. It has been decided by the Council and Committee to issue gratis to each member a ticket for himself and lady, on application, and a limited number of extra tickets at \$1 each. Invitations will be extended to a select list of guests.

A PLAN has been submitted in Kansas City, Mo., to equip the police with electric dark lanterns. The lamp contains a storage battery and is attached to the policeman's hat.

THE Bossert Electrical Construction Company recently shipped to the new United States Mint at Philadelphia one of the largest isolated electrical switchboards ever manufactured. The switchboard is entirely constructed of marble, copper and steel, and is 6 feet high and 36 feet long. There are 18 slabs of pink Tennessee marble, each 1½ inches thick. There are 42 double and triple pole switches, which range from 100 to 1,600 amperes. There are 78 circuit breakers and many meters, all of which combine to make the board an example of mechanical construction. The copper required to connect the generators or dynamos with different switches and current breakers weighs over two tons and the board complete as it will stand weighs ten tons. The board will carry 5,000 amperes at 110 volts, equal to 10,000 sixteen candle power lights. The switches have been arranged so that each will turn on either light or power, as may be desired. This was necessary, as there will be no other power aside from electricity used in the new Mint Building.

THE Rapid Transit Commissioners met March 7th in this city and appointed Dr. Louis Duncan and Cary T. Hutchinson as electrical

experts to assist Chief Engineer Parsons. These two engineers will have charge of all the electrical work to be done in the tunnel. Heins and La Farge were appointed advising architects to assist Chief Engineer Parsons in designing all the stations needed on the Rapid Transit routes.

ACCORDING to the "Elektrotechnische Zeitschrift," at the end of the past year there were in operation in Germany about 1,900 miles of electric railways, having a total length of track of 2,800 miles, as compared with 1,430 miles and 1,980 miles respectively for the previous year. The rest of the figures given are only up to September 1, 1900, when the aggregate output of the generators installed for working 2,660 miles of track amounted to 75,608 kw. as compared with 52,509 kw. for 1,760 miles of track in the previous year, or an increase of 44 per cent. On the other hand, the number of station batteries installed up to the same date showed an increase of only about 25 per cent., as against 164 per cent. for the previous year, the total capacity of the accumulators amounting to 16,890, compared with 13,532 kw. on September 1, 1899.

A HARTFORD, CONN., inventor has brought out a call box telephone, which resembles in general appearance a fire alarm box. The door can be unlocked by dropping a cent in a slot. Inside the box is the mechanical pay station telephone with slots for dimes and nickels.

THE old gas lamps along the Victoria Embankment in London have been replaced by modern electric arc lights. The total number of lamps to be erected under the present scheme is 147, of which 67 are on the parapets, and 80 on the kerbs and on Westminster Bridge. The former only are as yet installed. The lamps are all of the long-burning open type, the parapet lamps burning 40 hours without re-trimming, while those which are to be erected on standards along the kerb will run for 60 to 80 hours without attention. The parapet lamps are in series of 10, taking 6 amperes; it is said to be the first time that such small current arc lamps have been successfully used for public lighting in this manner. The kerb lamps will be of the 12-ampere type, containing 6 feet of carbon, and are to be arranged to lower for trimming. Although such a great length of carbon is used, the lamp is only the same length as the arc lamps now generally in use.

PROF. FESSENDEN, the Weather Bureau's wireless telegraphy expert, has been on the North Carolina coast, where he erected stations between Roanoke Island and Hatteras. The tests so far have been entirely satisfactory, and he has gone to Washington to report in person to Chief Willis Moore. It is proposed to erect stations at Cape Henry and Norfolk, so that weather reports can be disseminated to ships at sea, which, in case of approaching storms, would greatly lessen the danger of ships being driven ashore at dangerous Hatteras.

EXPERIMENTS with Becquerel rays are being conducted in great secrecy at Berlin, according to a communication received at the State Department from Consul-General Guenther at Frankfort, Germany. These experiments are said to have disclosed the fact that an entirely new element is responsible for the Becquerel

rays, and that they render almost every transparent substance luminous in the darkness. Consul-General Guenther says that the rays make it possible to tell genuine diamonds from artificial ones in the dark, which would prove of great practical importance in testing. The experiments, it is said, also have demonstrated that rays emanating from a large quantity of the new element make the air such a conductor of electricity as to promise that the property can be utilized in wireless telegraphy. The results of the experiments, it is said, will be laid before Emperor William, "which," says the Consul-General, "seems to indicate that the discovery is regarded as one of great importance."

Mr. J. B. Charleson, who is superintending for the Dominion Government the construction of the all-Canadian telegraph line to the Yukon district, has arrived in Vancouver, B. C., with his party, and will start at once to exploit a route for 100 miles of telegraph between Fort Simpson and Hazelton. The line is regarded as of the greatest importance, as it will place the large fleet of northern vessels, passing Fort Simpson, in telegraphic communication with the outside world, as well as all the northern canneries, and wrecks and casualties will thus be reported promptly.

Card From the Ericsson Telephone Company.

Editor ELECTRICITY.

SIR: The attention of the writer was called to a little note in your issue of February 6 with relation to the Syracuse, N. Y., exchange of the Syracuse Telephone Company. While appreciating the reference made therein to the telephones used by the Syracuse Telephone Company as a type of the L. M. Ericsson telephone of Stockholm, we wish to say that you do us too much honor, as the instruments are neither the L. M. Ericsson make or our make, but are what we consider a rank imitation. The switchboard is not even an imitation of the Ericsson switchboard.

In this connection it might be just for us to say that the goods made by L. M. Ericsson & Co., Stockholm, Sweden, have been sold outright for nearly a quarter of a century, and they stand on their merits and hold their own in the markets of the world solely because of their superiority. It is not strange that imitations of such superior goods are sold, and not only sold but are sometimes confounded with the genuine by those who do not know the difference. Would merely say that the supreme test of all things, good or bad, is "time," and whether the goods are the genuine or the imitation we are quite willing to have time and use prove. Very truly yours,

ERICSSON TELEPHONE COMPANY.

Francis O. Matthiessen.

Mr. F. O. Matthiessen died in Paris, France, on March 8. Francis O. Matthiessen was born December 23, 1833, in the Dutchy of Holstein, Germany, and was educated in the City of Altona, near Hamburg. He came to this country when about 26 years old, and engaged in the sugar refining business. Mr. Matthiessen at the time of his death was interested in a number of enterprises, such as the Goubert Manufacturing Company, the North Jersey Street Railway Company, and the Weston Electrical Instrument Company of Newark, N. J., of which he was president.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 18.

HINTS FOR THE DYNAMO TENDER.

An attendant for electrical machinery should understand the elementary principles of electricity, the units of measurement and how to apply them, the laws and phenomena of induction, the principle involved in the different styles of dynamos, and have an intelligent knowledge of the electrical science in all its branches.

The following consists of suggestions covering some of the more important features with which a dynamo attendant should be familiar.

CLEANLINESS I place first in the list, for I believe it is the most important feature in the operation of a central station. What a story the appearance of a dynamo room and the machines tell to the close observer.

It is unnecessary to comment, to any length, on this point, because the fact has been so well established, that the greatest enemy to the successful operation of electrical machinery is dirt. The fact that a generator may be nicely painted and well finished does not increase its efficiency, but it certainly will act as an incentive for the operator to keep it clean and of a good appearance, and that of itself is of considerable importance.

Machines should always be cleaned immediately after they are shut down. Better results can be accomplished then than if allowed to cool, as it is then much more difficult to remove the oil and grit.

If convenient a suitable canvas cover should be provided and placed over a machine after it has been cleaned to prevent dust settling on it.

INSTALLATION.—The location selected for the placing of a dynamo should be cool and dry and in such a position if possible that the machine will be easily accessible on all sides. Do not place it in such a way that it would be impossible to remove the armature without moving the entire machine. This is a mistake that is often thoughtlessly made. In placing dynamos of considerable size, a foundation of brick or stone should be provided, constructed if possible separate from the walls of the building. In any case a level and firm foundation ought to be provided.

In placing the parts of a machine together and mounting the apparatus the greatest possible care should be taken to thoroughly clean each part and all connections. The shaft and bearings must be thoroughly wiped before putting the armature in place.

BELTING.—The kind of belting to be used is to a great extent a matter of opinion. The standard light weight, double leather belt is however applicable in most cases and as a general rule satisfactory. Use endless belts by all means as it is not advisable to operate a high speed machine of any description by laced belts.

In estimating the size of belt required to do a certain amount of work, it may be taken as a guide that a single belt will transmit approximately one hp. for each inch in width when

running at a speed of 1,000 feet per minute. If the speed is greater, the power transmitted will be correspondingly increased, and if it be less the power will be correspondingly decreased.

Always operate a leather belt with the smooth surface next the pulleys and the slack (running) side on top if possible.

On new belts an allowance for stretching should be made, in placing the machine, of $\frac{1}{4}$ of an inch to the foot in its length. In calculating for speed it is advisable to allow one per cent. for slipping, as it is certain to occur to this extent when doing work. Endless belts can be made without the use of rivets; use specially prepared cement for splicing and avoid the use of rivets.

DIRECTIONS FOR STARTING.—Make a careful examination of the entire machine to see if the connections are all right and also to make sure that no tools have been left carelessly lying about. This sort of an examination becomes a second nature to attendants who have been operating machines for some time and they unconsciously perform this very important proceeding without thinking that they are doing it. Note if the brushes are all set and have the proper tension. It is often customary to bring dynamos to their full speed before lowering the brushes into contact with the commutator. This is not at all necessary, in fact it is much better to place and set all the brushes before starting at all unless there is some danger of the machine being turned backwards, which would injure copper brushes. The main switch connecting a dynamo into the circuit should not be thrown in until the dynamo is "built up," that is, operating at the required voltage indicated by a voltmeter or pilot lamp; however this does not apply if a dynamo is operating an independent circuit, for then it does no harm to have the circuit on and allow it to build up with the machine. Never throw a heavy load on a generator suddenly if it can possibly be avoided, but gradually build up its load by means of circuit switches, or if operating in multiple with other machines, the shifting of the load should be done gradually.

DIRECTIONS FOR RUNNING.—If a machine is new and is being run for the first time, special attention should be paid to it for a while, and for a short time it is advisable to run it at less than full load if at all convenient to do so. Fresh oil should be added to the bearings quite often and the old run off. Be on the alert for excessive heating of the bearings, field coils or armature, and if any is discovered no time should be lost in finding the cause and applying a remedy.

Excessive heating of the armature can be discovered while a machine is running by placing the hand in the current of air that is set in motion by its force.

Special care should be taken in handling generators which are operating at an EMF. of 500 volts or over. "Keep one hand in your pocket" is an old saying; however this is not always convenient to do, but it serves to illustrate the impression we wish to convey.

Do not overload a dynamo, as this is the direct cause of probably as much trouble as any other individual thing.

Keep all iron or steel tools away as they might be drawn into the machine by the magnetism and be the cause of entirely ruining it. Copper or brass oil cans should be used for this same reason.

DIRECTIONS FOR STOPPING.—If a generator

is operating in parallel with others gradually remove the load until its ammeter indicates little or no current, then open the switch. Under no circumstances allow the speed to be lowered or the magnetism weakened (except enough to regulate the EMF.) before disconnecting. If this were done the machine would probably run as a motor, taking its current from the main circuit, which might cause no end of damage.

If a machine is operating alone on a circuit, gradually decrease the speed and allow it to stop without touching either the brushes or switches. Do not switch out a dynamo at full or partial load except in a case of emergency.

Never lift a brush while a dynamo is generating current, except when there are other brushes on the same side to remain in contact.

As soon as a dynamo is "shut-down" clean it thoroughly and raise the brushes, taking care to wipe all the copper dust from the commutator, brushes and brush-holders, after which it should be covered, if a cover is provided.

SPARKING AT BRUSHES.—The causes resulting in this trouble are very different in different types of machines. Most all arc dynamos spark considerable while operating, but that is not objectionable as they are designed to stand it.

A few of the more common causes of this trouble in direct current multiple machines are brushes not set at the neutral point, current overload, rough commutator, open coil in armature, short circuited coil, leak from coil to frame, weak or uneven magnetism, bad brushes or unnecessary vibration of the machine.

If the sparking occurs from the brushes not being set at the neutral point it can be readily overcome by shifting the rocker arm either backwards or forwards until the neutral or non-sparking point is found.

An overload will produce sparking as probably the capacity of the commutator and brushes may not be sufficient, and in this case there is no remedy except to reduce the load.

It is not a difficult matter to keep a commutator, which has no inherent defects, in good condition if attended to properly from the start; but if allowed to get rough and full of ridges it takes considerable care and work to bring it right. It is very damaging to a machine to run it with the commutator in bad condition.

An open coil can be detected by a spark that will appear to travel almost around the commutator. The defective coil can be found by noticing which plate is most damaged by the spark. If there is not time to repair it the dynamo may be operated for a short while without damage by connecting the two plates together between which the open coil exists. An open very seldom occurs in the coil itself but more generally where the wire is connected to the commutator plate. This is easily found and remedied.

A short-circuited coil will heat much more than any of the others and is very liable to burn out entirely. It may be detected by holding a piece of iron between the pole pieces and in such a way that it will be influenced by the magnetism, and if the pull varies suddenly at a point in each revolution it demonstrates that a defective coil exists. Of course this test must be made while the machine is generating current.

A leak from the windings to the frame may

be detected by testing with a magneto bell or by the use of a battery and telephone receiver.

Weak or uneven magnetism will cause sparking and also result in the dynamo not generating its full EMF. when running at the required speed.

The brushes should set on the commutator in such a way that the intended contact surface shall all be in contact, and also they should have no ragged edges but ought to be kept properly trimmed.

It may be said that excessive heat exists if the armature or field coils get too hot to keep the hand on for a short time.

Article No. 19 will be entitled "Rules, Tables, and Formulae."

[NOTE.—In the future an article will be devoted to explaining how to test for trouble in dynamos.]

IV.—POLYPHASE ELECTRIC RAILWAYS IN EUROPE.

BY FRANK C. PERKINS.

Stansstadt-Engelberg Three-Phase Railway.

The three-phase adhesion and rack railway operated between Stansstadt and Engelberg is of interest to the reader in connection with the preceding polyphase roads, described during the last month in *ELECTRICITY*. The highest potential used on any of the roads was that be-

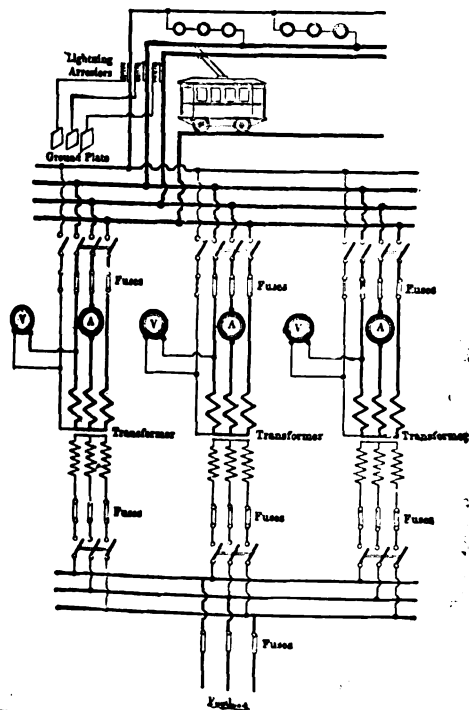


FIG. 1.—SUB-STATION AND FEEDER CONNECTIONS FOR STEP-DOWN TRANSFORMERS ON POLYPHASE ELECTRIC RAILWAY.

tween Burgdorf and Thun, described and illustrated in the second serial on February 27, pages 122-124, No. 8 of *ELECTRICITY*. The high potential of 16,000 volts was used upon the transmission line, the working contact line using however only 750 volts. In obtaining this high potential step-up transformers were required as the generators only supplied a three-phase current of 4,000 volts potential directly from the armatures.

While the potential of the power transmission line on the Jungfrau Polyphase Railway was not as high as on the Burgdorf-Thun Railway still it was high enough for economy and has one advantage worth considering. The

high tension used is generated directly by the machines without the use of step-up transformers and cheapening the first cost of the road by that amount, as well as the loss in operation of those static transformers. Against this, however, must be figured the additional saving on account of the use of 16,000 volts as against 7,000 volts, the former potential being perfectly feasible with the step-up transformers. This polyphase road was fully illustrated and described in the third serial, on March 6, pages 137-139 of No. 9 of *ELECTRICITY*. Step-down transformers are necessary in any of the designs, and these are usually placed in sub-stations at various points on the route.

A diagram is shown in Fig. 1 of the connections for the step-down transformers used on the Jungfrau line and the connections to the

cars are longer than the locomotives, as will be seen in the one above on the track. Each car is fitted with two motors of about 35 horse power each. There are in operation on this line 8 of these motor cars and three locomotives. The locomotives are equipped with three-phase motors, as shown in illustration, Fig. 3. Each motor has a capacity of 75 horse power making the total capacity of the locomotive 150 hp. The working potential used on the contact line is 750 volts.

The Outlook for Copper.

The consumption of copper during the year 1900 has been abnormally large, and shows a great increase over that of the previous year. In England the increase has been nearly 21,000

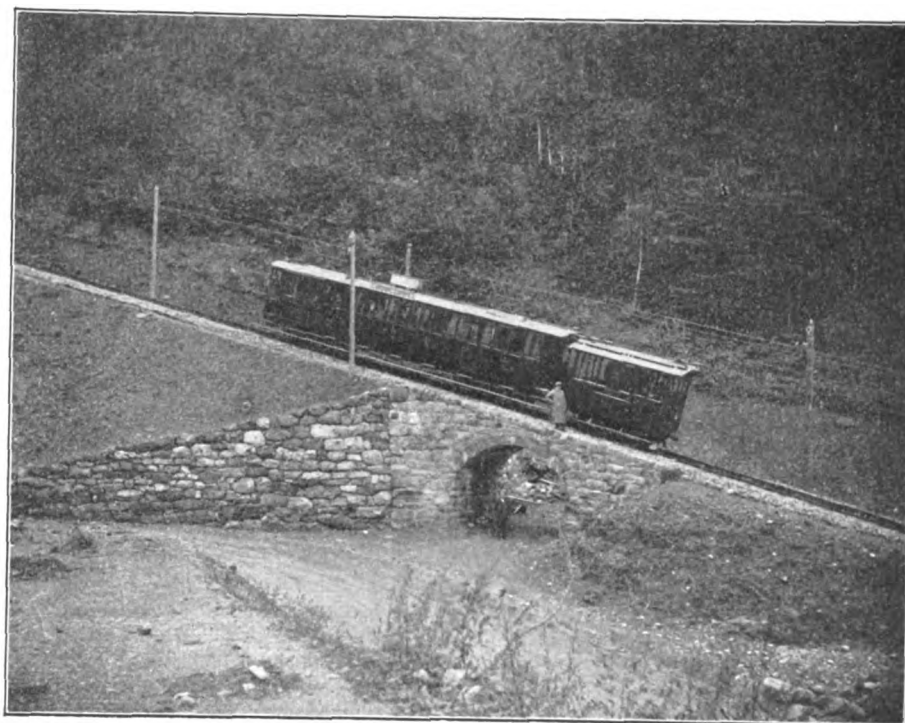


FIG. 2.—STANSSTADT-ENGELBERG POLYPHASE ELECTRIC RAILWAY.

feeders and contact conductors which supply the low tension current to the locomotives. Two overhead trolley wires are always necessary, the track acting as the third conductor.

The electrical equipment of the Jungfrau Railway was supplied by the Maschinenfabrik Oerlikon and the firm of Brown, Boveri & Cie, while that of the Stansstadt-Engelberg Road was installed by the latter firm.

This polyphase railway is 22½ kilometers long and is equipped with three-phase motor cars as well as three-phase locomotives.

The energy for operating this road is obtained from a water power near at hand. The generating station is supplied with turbines and generators of a total capacity of 600 horse power. The turbine plant consists of three horizontal wheels of a capacity of 200 horse power each. The alternators are directly connected to these wheels and are of the three-phase type built by Brown, Boveri & Cie and previously illustrated in one of the former serials.

The gradient on this road as well as those already described is very great, as will be noted by the illustration, Fig. 2, showing a train on a steep grade. This view gives a very good idea of the type of motor car used and the style of the polyphase locomotive operated on most of these lines. The polyphase motor

tons, and in Germany 15,000 tons, while Italy, Austria and Russia have taken 4,000 tons more from the United States than in 1899. The total European increase is about 38,500 tons, and it would appear from the statistics supplied that American consumption has increased 23,500 tons (that of 1899 over 1898 having increased 52,000 tons), making the total increase of Europe and the United States about 62,000 tons. This is mainly due to the development in the use of electricity, especially for traction and power purposes. The requirements for ammunition have also been exceptionally large; while the manufacture of sulphate has absorbed considerable.

Exports from Europe have diminished 20,215 tons, but from the United States they have increased 42,334 tons.

Production has increased 18,640 tons, or 7.3-16 per cent., in the United States, and the import into the United States about 7,500 tons, chiefly from Canada and Mexico. Supplies to Europe, exclusive of the United States, have decreased 690 tons, or one-half per cent. The total increase of production on the North American continent is about 25,500 tons.

The public stocks in England and France have increased 6,918 tons during the twelve months; but if the returns of stocks in the United States at the end of 1899 and 1900 re-

spectively are correct, American stocks have decreased 24,608 tons, making the total reduction in English, French and American stocks 17,690 tons, which represents the extent to which it would appear that consumption has exceeded production. That consumption is likely to continue large during the present year appears most probable. A contract has already been concluded for the Pacific cable of 8,800 miles, and the French and other Governments propose to largely extend their cable connections. Electric tramways and lighting are ex-

A PROPOSED ELECTRIC CONDUIT RAILWAY FOR LONDON.

An electric conduit street railway is about to be built in London, a short length of the proposed line having been recently constructed and inspected by electrical engineers and other persons interested. For the following description and criticism of the system we are indebted to the "Electrician," London. The system was devised by the London County Council's engineers for use on the routes between West-

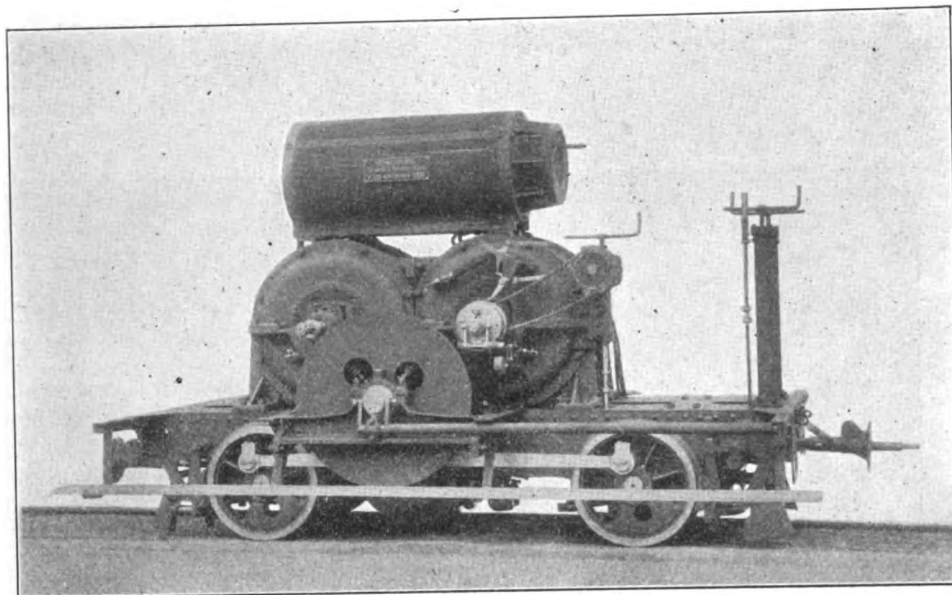


FIG 3.—THREE-PHASE LOCOMOTIVE ON STANSSTADT-ENGELBERG ELECTRIC RAILWAY.

tending in all the large towns and their suburbs; the use of telephones is increasing, while the necessity for more telegraph wires is apparent; and steam is being steadily supplanted by electric current for power purposes. The use of sulphate for combating vine and potato disease is on the increase, fully 25,000 tons of copper being consumed annually for this purpose. For steamships, marine engines and locomotives the demand promises to be good; considerable quantities will be required for ammunition, and India is expected to take more than during recent years.

Whether production will keep pace with the promised increase in consumption seems doubtful. Except in Canada, Mexico and Australia no new mines of much importance are being opened up, or are likely to be large producers for some time to come. The older mines show no signs of much increase, the increase in the production of the United States coming from the smaller mines. The Spanish and Portuguese mines do not materially increase, and the same may be said of the Cape mines and Boleo, the official returns made of the output of the principal mines under European management showing practically no change. Japan, however, may send larger supplies to Europe, and some further increase may be expected from Peru.—"Mining Reporter," Denver.

ELECTRIC street railways have been instituted at last at Cardiff, Wales, Mannheim, Germany, and in Auckland, New Zealand, according to the United States Consuls at those points, in reports to the Department of State at Washington. A modern service of this sort already has been put into operation at Mannheim, and a New York concern is arranging to build the road in Auckland at a cost of about a million dollars. The innovation at Cardiff is hailed with delight.

minster Bridge and Tooting, Kensington Gates and Blackfriars Road, St. George's Circus and Waterloo Road. Continuous current will be supplied at 500 volts from the generating station at Camberwell Green and from a sub-station at the Balham depot. The cars are to be double-decked on bogies, similar to that

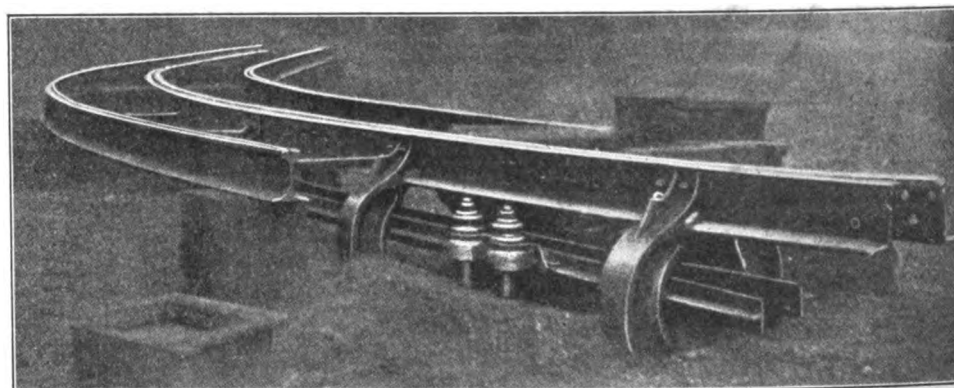


FIG. 1.—GENERAL VIEW OF PROPOSED LONDON COUNTY COUNCIL CONDUIT.

shown in operation on the Westinghouse track recently. The seating capacity is to be 64 to 70, and the speed within a 4 miles radius of Charing Cross, is to be 10 miles an hour. In accordance with the London County Council's Act of 1900, a description and drawings have been submitted to the Board of Trade for approval, and also to the metropolitan boroughs of Lambeth, Southwark, and Wandsworth. The last-named borough suggested some modifications, and these having been made, has intimated to the Board of Trade its approval of the system. The other road authorities have been informed of these modifications, and it is expected that they also will signify their approval.

Fig. 1 gives a general view of the conduit,

and Figs. 2, 3 and 4 are line drawings, showing sections through the insulator pit, through the concrete tube, and across the cast-iron yoke respectively. The tramways will be double track throughout, the gauge being 4 feet 8½ inches, and the track rails, of steel girder section, weighing 102 lbs. per yard, will be laid in the same position as those which now exist. The slot rails are of steel, Z section, weighing 50 lbs. per yard, with a drip lip along the inner edge of the slot. The width across the heads of the two rails will be 4½ inches. The rails are bolted to the yoke jaws, and further fixed by wooden wedges, the width of the slot being kept as near ½ inch as possible.

The conductors are two in number, of soft steel tees weighing 23 lbs. per yard, and carried on insulator supports at 15 feet intervals, the supports being arranged midway between the yokes (see Fig. 1). The insulators are of glazed brown earthenware, with double petticoat (see Fig. 5), mounted on cast-iron stems, which are cemented into the concrete. The curved brackets down to the conductor rails are of gun-metal, and the insulators are fixed by a nut and washer at the top of the stem, leather washers being provided to pinch against. A bell-shaped pot cover is placed over all to deflect any drippings clear of the insulator.

The cast-iron yokes are spaced 5 feet apart, the depth from the top of the slot rail to the bottom of conduit tube being 1 foot 9½ inches, and to the base of the yoke where it bears on the concrete 2 feet 1½ inch. The greatest width of the yoke measured across the track is 26 inches, and the section at the bottom is as shown in Fig. 6. The conduit tube is of concrete.

The covers over the insulator pits give an opening 1 foot square, and will be filled in with artificial granite, or whatever material is used as paving between the track rails.

Wherever the conduit is drained, a larger box

with opening 19 inches by 12 inches gives access to both insulator and drain pit, and a similar size of box will be employed wherever a section insulator is used, the conductor tees being divided into lengths of about half-a-mile.

Having now described the proposed conduit, we feel it our duty to criticise it, and we may say at once that, unfortunately, the remarks we have to make will be mainly of an adverse nature. There has been more trial and error in electrical conduit design than with anything else in connection with electric traction, and those conduits which are now successfully at work in Washington, New York, Paris, and elsewhere are the outcome of an immense amount of actual experience. It seems a pity,

therefore, that the designers of the London County Council conduit should have departed so considerably from what has almost come to be considered the standard method of laying such tracks. Dearly bought experience has proved that, before all else, every legitimate effort should be taken to prevent the closing in of the slot from lateral pressure due to traffic, changes of temperature, etc. This has

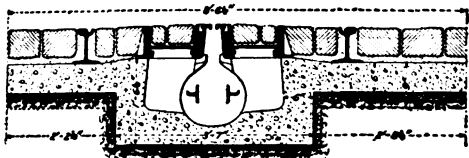


FIG. 2.

Section through Insulator Pit and Road Box.

been effected in central slot conduits now successfully running electrically by extending the yoke outwards to the bases of the track rails, and so rigidly connecting the whole together that widespread settling or spreading of track rails and conduits is entirely prevented. Of course, if the yoke stands by itself, as in the case of the Brussels conduit* for example, where the slot is in one of the track rails, then the yoke-casting must be made extra strong to withstand the pressure. This is the condition of the London County Council conduit, except that it is midway on the track, and yet we find that the dimensions of the yoke-casting are smallest where one would have expected them

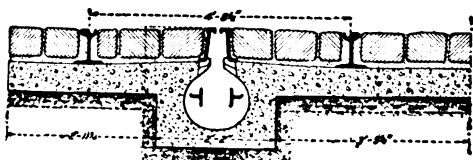


FIG. 3.

Section through Concrete Tube.

to be greatest. Thus, from Fig. 6, it will be seen that the depth from the bottom of the tube to the bottom of the yoke-casting is only 4 inches, whereas in the Westinghouse yoke (see Fig. 7) the dimension is 7½ inches, besides being wider in a direction parallel to the track. Quite independently of the strength to resist closing of the conduit due to its being extended under the track rails, the Westinghouse yoke is many times stronger than the London County Council yoke, and the New York and Paris yokes are also stronger than the London County Council yoke.

Experiments are to be made to see exactly what pressure is required to break the London

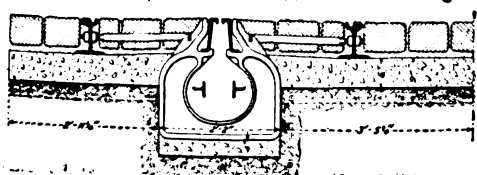


FIG. 4.

Section through Yoke.

County Council yokes as they now stand. We feel sure that no electric conduit in successful work could be found which would exhibit such scanty yoke dimensions, and we cannot help

*It may be mentioned that the engineers at Brussels did not attempt to make the width of the slot so small as is proposed for London, the dimension being 1½ inches. There is, further, very little traffic on those boulevards where the conduit is used. Obviously the London conditions—that is, comparatively narrow roads and exceedingly heavy traffic combined with the narrow ¾ inch slot—call for a much more solid construction.

thinking that it is taking unnecessary risk to depart so much from recent and proved practice in this respect. We understand that on no account is wood pavement to be used between the track rails, so that there will not be the difficulty from wood expanding when wet. We take it that the various authorities interested clearly understand this, and that they agree to granite sets, but we have some doubts as to whether the shopkeepers in the Westminster Bridge-road and elsewhere will like noisy sets being re-introduced.

The one thing to be said for the London County Council conduit is that as the yoke is only 26 inches wide the excavation will be less than if the yokes spanned right across the track. Seeing that the track rails have to be relaid, however, it is doubtful whether there will really be much saving, for the extended yoke need not be rectangular, as shown in Fig. 7, but can be of the more commonly employed

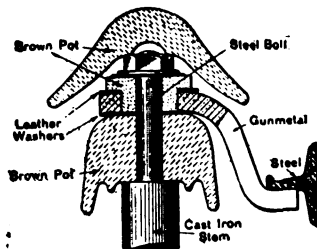


FIG. 5.

Sketch of Insulator in London County Council Conduit.

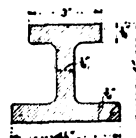


FIG. 6.

Section at Bottom of London Co. Council Conduit.

triangular shape as made use of in New York.

Practically all mistakes in the past have been traceable to attempted economy in first cost—either the conduit was skimpy, concrete too shallow, badly drained, or else the yoke castings too light.

Having pledged themselves to the conduit system of electric traction we do not think the London County Council is justified in considering too nicely the expense of constructing the

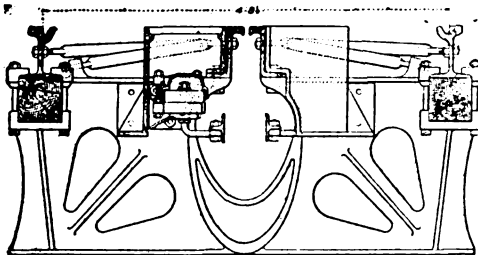


FIG. 7.

Section of Westinghouse Conduit.

conduit. They must face the drawback of expense properly as becomes the representative body of the leading city of the world.

One More System of Wireless Telegraphy.

THE latest proposition has been broached by the Department of Agriculture. Secretary Wilson, hearing that the Navy was casting about for a serviceable system of telegraphy, has written Admiral Bradford, Chief of the Equipment Bureau, to notify him that the Agriculture Department has been experimenting for some time with wireless telegraphy, and has attained remarkable results. His experts assert positively that they have evolved a system radically different from Marconi's, and of far greater efficiency. For obvious reasons the details of the process are kept secret, but it is probable that within a short time a practical exhibition will be made on board of a naval vessel. The outcome will be watched

with the greatest interest by all naval men, particularly in view of the announcement that not only Great Britain, but Germany and the other European maritime powers already have ordered the installation of wireless plants in their navies.

PARIS LETTER.

Special Correspondence of *ELECTRICITY*.

A Combined Voltmeter and Ampere Meter With an Adjustable Field.

M. Pellat has lately presented to the French Society of Physics, in the name of M. Menges, a galvanometer of the Deprez D'Arsonval type, which may be used as an ampere meter, or as a voltmeter in which the magnetic field is capable of regulation. To accomplish this result the movable parts turn about a horizontal axis; both of the two soft iron armatures are joined together by blocks of copper, which also oscillate to a slight extent in a horizontal arc, the axis is far from passing through the center of gravity for it is placed in such a way that both the armatures lean slightly to one side under the influence of the weight of the magnet which is placed horizontally above, but not having sufficient force to raise it; above the pole pieces the magnet is placed in magnetic derivation and formed of a piece of soft iron which by a screw may cause it to approach or move to a more or less extent from the poles.

It may be understood that in regulating the position of the piece of soft iron that it becomes possible to arrange the iron armatures to just that critical position where their weights are counterbalanced by the attraction of the magnet. In this position whatever may be its magnetic intensity, the magnetic induction which crosses the armature is always the same, for the lifting force depends solely on the induction. The magnetic induction is then always of the same intensity in the inter iron space of the field.

Wireless Telegraphy in Connection With the Human Body and Metals as Screens.

M. Guarini and F. Poncelet have just made a series of experiments on this subject, which they have presented to the Parisian Academy of Sciences; they employed a Wimschurst electro-static machine provided with the usual condensers for the production of electricity of high potential.

At some distance from the transmitter they placed an ordinary Marconi receiver.

The electric undulations, generated by sparks produced between the ball terminals of the Wimschurst machine, radiated in all directions. Considering their effects on the coherer these waves could be classified under three divisions: the first act directly upon the coherer, the second effect the coherer only by reflection, while the third does not effect it at all.

As a result of these experiments it was found that only the direct waves effected the coherer, for it remained inactive when they intercepted them by interposing a screen between it and the Wimschurst machine.

The human body perfectly fulfilled the functions of a screen; the bell of the receiver remained silent each time such an interposition was made.

A sheet of tin of small area did not prevent the radiations, but from the time the face of

the plate, which was turned towards the transmitter, was connected to earth, the coherer ceased to operate, for in this instance the radiation traveled through the soil. The conclusions were that, isolated, the tin plate became a new radiator operating by induction from one pole to the other. The Hertzian waves are therefore susceptible of being governed by inductive action, which may be prevented by interposing a metallic screen and conducting it to earth. The result of these experiments are of great importance in preventing the reverberations of signals from one relay to the other, as employed in the Guarini system, and also to prevent the action of transmitters on the coherer at the same station.

Terrestrial Magnetism and Sun Spots.

At the last meeting of the Parisian Academy of Sciences, held the 4th of February, M. Mascart, Director of the Central Bureau of Meteorology, presented a communication from M. Angot, summing up a work undertaken by him with the purpose in view of determining the influence of sun spots on the earth's magnetism, taken from observations made during a period of several years at the Parc St. Maur, near Paris, and at Greenwich, England, and he found that the mean variations comprised two terms, one being independent of, and the other proportional to the number of sun spots, that is to say in conformity with the sun's activity.

Coal in France.

Coal from the North and from the Calais section maintains a firm price. All the coal producers who are in the market keep the rates high. Manufacturers who have bargained for their coal supply will regret doing so for the price will be much lower. In the North the prices actually vary from 21 and even 19 francs to 30 francs per ton according to the quality.

The central coal mining districts have shown indications of making the price still higher, but protestations are unanimous and the Lyons Chamber of Commerce has just asked the Minister of Public Works to be kind enough to again study the tariff question of the Paris-Lyons Mediterranean Railroad, in order to provide for the transportation of American coal from the port of Marseilles.

ELECTRIC LIGHTING FOR RAILWAY CARS IN GERMANY.

The deplorable railway accident at Offenbach-on-Main, writes Consul General Frank H. Mason in a report to the State Department at Washington, has led to a sharp and thorough inquiry into the danger which may attach to the illumination of railway passenger cars by means of gas and the greater comparative safety of electric lighting. The accident referred to was a collision between the rear car of a vestibule express train backing to repass a block signal which had been overrun in a thick fog and the engine of a local passenger train which was following the express. The engine crushed its way through nearly half the length of the car, killing many of the passengers in the five rear compartments, of which the car comprised ten, all opening into an aisle or passageway along the side of the carriage.

In this crush, the chimney of the engine was cut away and the front of the boiler so broken in that the smoke and flame from the flues poured out into the wrecked car.

The passengers in the front sections of the

car escaped by the door and windows, but before aid could reach the survivors in the rear ones there was a loud explosion, which tore the wreck to splinters, set the interior on fire, and sealed the fate of those who still remained alive. This was the original and generally accepted account of the affair, although the railway officials have claimed, and the official report tacitly admits, that the explosion occurred later and when the whole interior of the wrecked car had been set on fire by the engine and was all ablaze, the point of contention being that the explosion did not of itself increase the loss of life.

However this may have been, the explosion did occur, and its nature and origin are thus explained: The car was lighted by what is known as the Pintsch system, and the supply of gas was carried in two cylinders of galvanized-iron plate about 12 feet in length which hung lengthwise beneath the floor at the middle of the car. In the collision, both these cylinders were torn loose from their fastenings and thrown into transverse positions across the track, still beneath the car. Neither cylinder exploded, but the gas from their torn connections rushed out and filled the car above, forming in a few moments a mixture of gas and air which, being ignited by fire from the engine, exploded, with the result above described.

The question of the moment is whether the Pintsch system of gas lighting for passenger cars, which has been during recent years practically universal on the State railways of Prussia, should not be replaced by electric apparatus, and this theme the technical press is now discussing with great energy and earnestness. Under this system rich coal gas, rendered still more luminous by a 25 per cent. admixture of acetylene gas, is compressed into cylindrical reservoirs and burned in specially devised lamps by burners which automatically adapt the flame to the varying pressure in the cylinders. In itself this enriched gas is not explosive, but it naturally forms an explosive mixture when combined with a certain percentage of atmospheric air. The system has been recognized as a great improvement over the stearin candles, colza oil, kerosene, and other lamps which had been previously used, and was regarded as satisfactory until electric lighting came into general use in streets and buildings. About ten years ago experiments were begun on the express trains, Frankfurt-Bebra and Stuttgart-Halle, with an electric system in which a small dynamo, placed in the baggage car and geared to an axle of the running gear, generated electric current at a voltage sufficiently above the point of utility to give a surplus, which charged a small storage battery that supplied the lamps when the train was not in motion. This worked so satisfactorily that in 1893 electric lights were adopted for the postal cars, of which there are about three thousand in use in Germany.

A postal car requires for ordinary service the illumination afforded by about fourteen full gaslights, which not only consumed rapidly the oxygen in the car, but in summer heated it to such a degree that with heat, vitiated air, and varying light supply the comfort, health, and eyesight of the employees were seriously compromised. For this reason, the electric light has become all but universal in the postal cars of Germany, each of which either carries its small dynamo and accumulator, and thus operates independently, or is

provided with storage batteries that are charged from an outside source before the car begins its journey. The storage battery used for this purpose is of a type known as the Bosc accumulator, four of which, each containing eight cells, carry sufficient energy to supply nine to eleven 12-candle incandescent lights during two nights.

Although this system, as well as the self-generating apparatus used in the two express trains above cited, has worked satisfactorily, it is recognized that the general substitution of electricity for gas in railway lighting throughout Prussia would involve not only large expenditures, but several important technical difficulties. To discard wholly the Pintsch system would mean throwing away an immense store of costly apparatus and the purchase of an entire new outfit, in which no part of the old material could be used. During the period of transition, when part of the cars in a train would be equipped with gas and part with electricity, difficulties would occur which would be serious in Germany, where so many trains do not make their entire run intact, but are cut into sections for branch lines at one point and reassembled or added to at another. In the management of postal cars, which are loaded at the point of departure and make a uniform through run without change, the loading and unloading of charged and exhausted storage batteries involves no difficulty, but this is not the case with passenger cars.

Experiments are now being made on a train between Berlin and Cologne with the Stone system of electric lighting, in which each car carries a small dynamo geared to a wheel axle and an accumulator, both hung beneath the floor of the car. This system has proved successful in England, but it is claimed here that the varying speed and stoppages of the train causes variations and unsteadiness in the light, which the accumulator does not successfully correct. Finally, the instances where gas has proved a source of actual danger in accidents have been so rare and its use has been on the whole so satisfactory that, in view of the cost and technical difficulties which a general substitution of electrical lighting would involve, expert opinion is still divided as to the wisdom or necessity of such a change.

Cost of Electric Current in Massachusetts

The Board of Gas and Electric Light Commissioners of Massachusetts have submitted to the House a communication in response to the order which was passed by that body recently. The order asked the Commissioners to state the cost of manufacturing and distributing electric light, and what, in their opinion, is a fair and reasonable price for consumers to pay for the same. In answering they say the order as passed presents peculiar difficulties in the way of a clear and specific reply. "As we understand it, it is general in character and does not apply to any particular company or locality, and requires a statement of the cost per kilowatt hour, the unit in common use. There is necessarily a considerable variation in the different companies under different conditions, in the class of both manufacture and distribution, and there is no standard of cost in either of these departments which is applicable to companies generally.

"The cost of generating varies materially, according to whether water power or steam power is used. If the latter, the pipe or steam plant in use, the cost of fuel and ample

water supply, the relation of the ordinary to the maximum demand and the conservative steadiness of the daily station load, are important factors affecting the generating cost. Using the term distribution in its strictest sense, the variable factor of most importance affecting the cost is probably the relation of the volume of business to the area in which the electricity is supplied. If the term distribution be used in the wider sense to include all the cost outside of the station, such as management and taxes, the volume of business and the value of the plant and the relation of these two to each other are important in determining the cost per unit. When the fair and reasonable price to the consumer is to be determined, not only these variables to the cost of production and distribution are to be considered, but the necessary charges for such depreciation as may not be provided otherwise together with interest or dividends upon the investment.

"The last named is frequently of more importance than any of the others and may vary more than the others according to the relation of the volume of business to the investment. From data in the annual returns it appears that the cost at the station or cost of manufacturing varied during the year, ended June 30, 1900, in different companies from less than 2 or more than 7 cents per kilowatt hour; the cost of distribution, including management, from 1 to nearly 6 cents, while the dividend cost varied more widely.

"These facts indicate the difficulty of applying to companies generally any definite statement of costs and the necessity for a careful analysis of local conditions before attempting to determine the fair and reasonable cost per unit of these items in any particular company. These suggestions, we trust, explain our inability to reply to the inquiry as specifically as we would wish and as may have been expected when the order was passed."—The "American Gas Light Journal."

ELECTROLYSIS OF WATER MAINS IN READING, PA.

Mr. A. A. Knudson, E. E., was recently called upon to examine the water mains of Reading, Pa., with a view to determining what effect, if any, the stray electric currents from the street railway systems were having upon them. The result of Mr. Knudson's investigation is embodied in an interesting report in pamphlet form. After stating at what points of the city the current in the pipes is positive to the rails, Mr. Knudson concludes as follows:

It has been intimated to me by officers of both railway companies in Reading that any changes suggested in their systems for the better protection of the water mains would be carried out. As one expressed it, "such changes would revert to their advantage in the saving of fuel."

In making the following recommendations, therefore, more freedom is felt in specifying methods than would otherwise be the case, and those made are considered only as absolutely necessary to protect the water piping system of the city from further damage.

We will first consider the points of danger on the lines of the United Traction Company.

It is respectfully recommended that where old and practically unbonded rails exist, as has been shown, and are the admitted cause of

current escape to the water mains, that such tracks be relayed with new rails as soon as such work can be arranged for.

If the U. T. Co. are not immediately prepared to relay such tracks, then the present rails should be newly bonded without delay. This applies to the Mountain road; Mineral Spring road and at the car barns; Schuylkill avenue, Perkiomen avenue and on Center avenue.

It would also be in the line of more permanent protection if on the long lines, such as Mineral Springs, Perkiomen avenue, Schuylkill avenue and the Mountain road, overhead return track feeders be placed with tap connections to the rails at intervals of from 300 to 500 feet. Few track feeders have been noticed on the lines in Reading. Few are needed on the U. T. Co.'s lines in the busiest section of the city, owing to the many intersecting tracks well jointed and well bonded, as the tests indicate, in a large measure taking the place of feeders. This unusually favorable condition has already been referred to; on some of the longer lines, however, the case is different, and such lines should receive as much care and attention in this respect, if the water mains are to be protected, as lines in the central portion of the city.

The track crossing at Fourth and Franklin streets show differences of potential at every joint, ranging from .2 of a volt to .6. This crossing shows evidence of wear and the entire crossing should be renewed, as such conditions cause a diversion of the current from the rails to the water mains; also the crossing at Sixth and Franklin streets, both of these crossings should receive early attention.

Several tests in the city on the U. T. Co.'s lines have been made at other street crossings, and at switches on the turnouts, and at railroad crossings, but with the above exception those that have been examined are found to be in good order.

READING & SOUTHWESTERN RAILWAY.

The light rails on Franklin street with inefficient bond result in a poor return to their power station for the railway current, and causes much of it to be diverted to the water mains under the street.

I am not aware what the intentions of this company are as to relaying these rails with new and heavier ones in the near future, but if they are to remain for any length of time, it is recommended they should be rebonded without delay. Further than this an auxiliary track return wire should be placed on the poles, running from the negative of the power station to and through Franklin street to Ninth and connecting both rails of the track at that point and at intervals along the line of not less than 400 feet. There should also be cross bonds between the two rails at about midway between the tap connections; the most important point on this line, and one that should receive first attention, is the Chestnut and Canal street railroad crossing. As the conditions at this crossing are peculiar and such as to require special attention, I have under the head of Supplementary, which is attached to this report, recommended a method which is specified and which I believe, if well carried out, will greatly lessen the escape of current to your water main and materially reduce the rate of damage to same in this vicinity, as well as preventing liability to accident.

In reference to these recommendations as a

whole, covering defects discovered on the lines of both companies operating in Reading, it should be said that they can only be regarded as a temporary and partial remedy for electrolysis. Large escapes of current and immediate damage to mains can be modified, but a single overhead trolley system, with grounded returns, is always more or less a menace to water mains.

There is one certain cure for electrolysis, however, and although well known it may be mentioned here. I refer to the double trolley, overhead or underground. The overhead being the least expensive to construct of the two, is more desirable, except for large cities. The overhead method has been in successful operation in Cincinnati for about ten years, and also in a somewhat improved construction in the District of Columbia for about two years under acts of Congress. The difference in appearance between the two is scarcely noticeable. There being no electrical connection with the rails; the return currents are kept out of the ground and consequently there is no escape to the water mains.

No bonds are needed at the rail joints, nor auxiliary track returns (heavy insulated wires) on the poles.

The saving in fuel which such change would effect, particularly on the lines of the R. & S. W. road, would, I feel sure, in a comparatively short time, equal the cost of making such change.

It should always be borne in mind that so long as the single trolley system, using the rails and ground for a return, is in use, there can be no complete relief from electrolytic damage. The recommendations made in this report, if carried out, will only be palliatives; and the city, in seeing that they are carried out by the railway companies, should so protect itself that hereafter it cannot be claimed by the railway companies that they, having complied with the city's requirements, are not responsible for subsequent injury.

It behooves the city to proceed carefully in this matter, in order that it may not by appearing to accept as sufficient the partial remedies herein recommended, relieve the electric railway companies from responsibility for the injuries which must ultimately result if the single trolley system is continued.

Safety to life, as well as safety to water mains, however, demand that the railway crossings at Chestnut and Canal streets, herein mentioned, receive immediate attention.

Respectively submitted,
(Signed) A. A. KNUDSON.

CANADIAN NOTES.

(From our Ottawa Correspondent.)

The Grand Trunk Railway has under consideration a plan to run electric cars of its own over the Victoria Bridge, across the St. Lawrence at Montreal. The cars will connect with other electric lines on both sides of the river.

It is reported that arrangements are nearly completed for securing electric power for the city of Toronto, Ont., from Niagara Falls by the end of the coming summer at a great reduction of the present cost of power. Preliminaries for the production and delivery in Toronto have been worked out. It is said that the specifications, as prepared, show that the power can be delivered in the city at a sum amounting to about \$600,000.

LEGAL NOTES.

Last week the Bullock Electric Manufacturing Company filed in the U. S. Circuit Court of Cincinnati, O., a demurrer to the Westinghouse Electrical Manufacturing Company's bill of complaint on an alleged infringement on three patents.

The Electric Storage Battery Company, March 5, brought suit in the United States Circuit Court, through its counsel, John R. Bennett, against the Gould Storage Battery Company, doing business in New York City and with its works located at Depew, N. Y., for the alleged infringement of the H. Ward Leonard patent for the improvement in systems of electrical distribution, praying for an injunction and claiming \$50,000 in damages.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended March 6:

Antwerp, 11 packages, \$1,571; Argentine Republic, 111 packages, \$6,031; Australia, 78 packages, \$16,995; Brazil, 971 packages, \$39,404; Bristol, 1 package, \$100; British East Indies, 1 case, \$100; British Possessions in Africa, 200 packages, \$19,482; 19 crates auto vehicles, \$4,288; British West Indies, 64 cases, \$500; Brussels, 12 packages, \$163; 8 cases, \$900; Central America, 337 packages, \$2,951; Chili, 25 packages, \$1,371; Copenhagen, 1 case motor vehicles, \$1,500; Cuba, 59 cases, \$6,480; Dundee, 3 crates trolley wagons, \$350; Dutch West Indies, 13 packages, \$462; Ecuador, 73 cases, \$774; French West Indies, 1 box, \$15; French Possessions in Africa, 1 case, \$38; Genoa, 1 case, \$64; Glasgow, 97 packages, \$1,021; 3 cases motors, \$182; 7 cases \$1,500; 128 reels electric cable, \$44,901; Hamburg, 7 packages locomobiles, \$4,200; 108 packages, \$8,058; Havre, 105 packages, \$6,405; Hayti, 2 packages, \$38; Liverpool, 313 packages, \$20,550; 3 packages motor vehicle parts, \$275; 4 packages auto registers, \$150; London, 192 packages, \$12,564; 34 packages motor vehicles, \$14,700; Manchester, 4 packages, \$895; 4 crates trolley wagons, \$5,750; Marseilles, 1 case, \$40; Mexico, 90 packages, \$1,017; 11 cases, \$110; Milan, 3 cases, \$220; Naples, 1 case, \$2,391; New Castle, 10 packages, \$1,000; New Zealand, 1 package, \$700; Peru, 31 cases, \$2,391; Rotterdam, 1 package, \$75; Sheffield, 2 cases, \$138; Siam, 41 packages, \$1,641; Southampton, 13 cases, \$489; Stockholm, 2 cases, \$61; U. S. Colombia, 2 packages, \$20; 1 case, \$562; Venezuela, 181 packages, \$1,331.

PERSONAL MENTION.

Gen. Nelson A. Miles was recently chosen president of the National Capitol Automobile Club of Washington, D. C.

Mr. Thomas E. Mitten of Milwaukee, Wis., has accepted a position in the operating department of the International Traction Company in Buffalo, N. Y., and will assist in executing a system for the rapid transportation of crowds during the Pan-American Exposition.

Mr. Thomas H. McLean, manager of the Toledo (O.) Traction Company, died of pneumonia a short time ago.

Capt. George E. Stone, head of the local telephone system in Cincinnati, O., died March 8 from pneumonia, following an operation for appendicitis.

INCORPORATIONS.

The Iola Electric Railway Company, Iola, Kan. Capital stock, \$50,000.

The Radiant Incandescent Light Company, Rochester N. Y. Capital stock, \$10,000. Directors: I. W. Paul, E. F. Craggs and J. A. Begy, all of Rochester.

The Bucyrus Gas & Electric Light Company, Bucyrus, O. Capital stock, \$150,000. Incorporators: Wilson C. Lemert, James B. Gormley, John W. Gwynne, Isaac C. Baxter and F. P. Kaler.

The New Jersey and Pennsylvania Power & Electric Company, Newark, N. J.—to furnish electricity for light, heat, etc. Capital stock, \$100,000. Incorporators: Howard Mutchler, Charles L. Hemingway, both of Easton, Pa.; Robert A. Montgomery of Lambertville, N. J., and Irvin W. Schultz of Phillipsburg, Pa.

The Standard Electric Company, Danville, Va.—to operate electrical engineers and contractors and to buy and sell supplies. Capital stock, \$5,000. Officers: James G. Penn, president; R. L. Dibrell, vice-president; James M. Williams, secretary and treasurer, and W. Drummond Marrow, manager.

The Lancaster County Railway & Light Company, Trenton, N. J.—to construct and operate electric light, gas and power plants, and railways outside of New Jersey. Capital stock, \$2,000,000. Incorporators: Samuel R. Shipley, William W. Griest, William B. Given, Philip B. Shaw and Lindley M. Garrison.

The Lyons & Sodus Bay Railway Company, Lyons, N. Y.—to build an electric road from Lyons to Sodus Point. Capital stock, \$400,000. Directors: Daniel B. Platt, Ira M. Ludington, Charles Van Voorhis, Stephen G. Hollister, Rochester; Sanger W. Case, Sodus; James D. Bashford, Calvin Hotchkiss, Charles P. Williams and Daniel Parton, Lyons.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED MARCH 5, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

669,218. Electric Railway. Hugo Hirst, London, Eng. Filed Jan. 29, 1901.

669,459. Electric Railway. Charles E. Fournier, New London, Conn. Filed June 7, 1900.

669,477. Electric Time-Switch. Henry J. Cogswell, Hartford, Conn. Filed July 20, 1899.

ELECTRIC LIGHTS AND APPLIANCES.

669,151. Electric Lamp Socket. John H. Trumbull and Henry Trumbull, Plainville, Conn. Filed Dec. 16, 1899.

669,306. Incandescent Lamp. John W. Howell, Newark, N. J., assignor to the General Electric Company of New York. Filed Nov. 25, 1896.

669,357. Construction of Carriers for Globes or Glasses of Electric Gas or Oil Lamps. Eadley Stanley, London, Eng. Filed Oct. 22, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

669,102. Combined Switch and Rheostat. Henry E. Reeve, Brooklyn, N. Y. Filed July 2, 1900.

669,238. Electric Igniter for Explosive Engines. William F. Davis, Milwaukee, Wis. Filed Jan. 2, 1900.

669,299. Dynamo-Electric Machine. Norman C. Bassett, Lynn, Mass., assignor to the General Electric Company of New York. Filed Dec. 12, 1899.

669,438. Magnetic Blow-Out Brush-Holder. Arthur C. Eastwood, Cleveland, O., assignor to the Electric Controller & Supply Company, same place. Filed Dec. 3, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

669,072. Telephone Apparatus. Peter C. Burns, Chicago, Ill. Filed July 31, 1899.

669,094. Telephone Apparatus. William O. Meissner, Chicago, Ill., assignor to the American Electric Telephone Company, same place. Filed May 2, 1898.

669,114. Support for Telephone Receiver. John J. Hartl, Chicago, Ill. Filed Oct. 26, 1900.

669,366. Telephone System. Clarence Malthaner, Minneapolis, Minn. Filed March 16, 1900.

669,471. Telephone Key. Ernest E. Yaxley and Charles C. Cadden, Chicago, Ill., assignors to the Victor Telephone Mfg. Company, same place. Filed Sept. 22, 1899. Renewed Jan. 5, 1901.

MISCELLANEOUS.

669,085. Battery Electrode. Gustavos Heidel, St. Louis, Mo. Filed March 21, 1900.

669,100. Physician's Electric Lamp. Purdy M. Randall, New York City, assignor, by mesne assignments, to the Unique Electrical Device Company, same place. Filed May 16, 1900.

669,130. Manufacture of Electrical Heating Appliances. Adolf Vogt, Westminster, Eng., assignor to the Electrical Resistance & Heating Company, Ltd., London, Eng. Filed May 23, 1900.

669,149. Capillary Electrometer for Relay Purposes. Albert

C. Crehore, Tarrytown, N. Y., and George O. Squier, Washington, D. C., assignor to the Crehore-Squier Intelligence Transmission Company, Cleveland, O. Filed Oct. 20, 1899.

669,155. Lightning Arrester. Herbert C. Wirt, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed April 30, 1897.

669,240. Electrode Plate for Electric Accumulator. Heinrich F. Hobel, Berlin, Germany, assignor to Akkumulatoren und Elektricitätswerke Aktiengesellschaft vorm. W. A. Boese & Co., Berlin, S. O., Germany. Filed Oct. 20, 1900.

669,291. Current-Interrupter. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company of New York. Filed Dec. 26, 1899.

669,310. Electric Metering System. Eustace Oxley, Lynn, Mass., assignor to the General Electric Company of New York. Filed Oct. 12, 1899.

669,336. Method of Local Applications of Electric Treatment to the Human Body. Herman Behrendt, Worms, Germany, assignor to Wilhelm Schmidt, same place. Filed Sept. 18, 1900.

669,338. Electric Clock. Sigismund Fischer, New York City, Filed Jan. 8, 1900.

669,358. Insulated Electric Conductor and Method of Making Same. Charles P. Steinmetz, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed July 30, 1900.

669,429. Coin-Controlled Electric-Circuit Closer. William H. Paine, Providence, R. I., assignor to the Automatic Tire Inflator Company, same place. Filed March 14, 1900.

669,439. Electrolytic Apparatus for Recovering Metals. Hans A. Frasch, Hamilton, Can. Filed July 30, 1900.

669,440. Method of Recovering Metals by Electrolysis. Hans A. Frasch, Hamilton, Can. Filed July 30, 1900.

669,441. Method of Producing Alkali by Electrolysis. Hans A. Frasch, Hamilton, Can. Filed Aug. 16, 1900.

669,442. Process of Recovering and Separating Metals by Electrolysis. Hans A. Frasch, Hamilton, Can. Filed Sept. 15, 1900.

669,486. Secondary Battery. Henry C. Porter, Chicago, Ill., assignor to Owen H. Fay, same place. Filed Dec. 27, 1899.

669,487. Battery Plate or Grid. Henry C. Porter, Chicago, Ill., assignor of one-half to the Owen H. Fay Livery Company, same place. Filed Feb. 5, 1900.

REISSUE.

11,893. Process of Operating Two Liquid Primary Batteries and Regenerating Element Thereof. Henry K. Hess, Albert J. Shinn and Carl Hering, Philadelphia, Pa., assignors to Herman J. Dercum, trustee, same place. Filed Jan. 24, 1901. Original No. 649,841, dated May 15, 1900.

DESIGNS.

34,173. Contact-Base for Incandescent Lamp. Irving E. Brown, Providence, R. I., assignor to the Providence Gas Burner Company, same place. Filed Feb. 7, 1901. Term of patent 14 years.

34,174. Contact-Ring for Incandescent Lamp Bases or Caps. Frederic H. Manchester, Providence, R. I., assignor to the Providence Gas Burner Company, same place. Filed Feb. 7, 1901. Term of patent 14 years.

COMMERCIAL PARAGRAPHS.

J. J. Reidy of New Haven, Conn., who handles the Donnelly Improved Steel Climber, which has been adopted by the leading telegraph and telephone companies in the country, writes that he is having an unusually large trade this year and that the Manhattan Electrical Supply Company of New York City alone has sold over 300 pairs of these climbers during the past two months.

The Sprague Electric Company reports an increase of sales over the corresponding month last year, and that the outlook for this year is exceedingly bright. Among recent orders are one 75 hp. and four 80 hp. motors for the Cooke Locomotive and Machine Co., Paterson, N. J.; 35 motors for the Central Lard Co., New York, who placed the order through their electrical engineers, Messrs. Floy & Carpenter; one 400 kw. generator, one 125 kw. generator, one 100 hp. motor and six 80 hp. motors, in addition to a number of small motors for the Wellston Portland Cement Co.; an order placed by Mr. George Hill, 150 Fifth avenue, New York, for the Dunmore Iron & Steel Company, Dunmore, Pa., consisting of one 62½ kw. generator, one 100 kw. generator and 25 motors of assorted sizes; one 75 kw. generator, one 25 hp. and one 30 hp. motor for the National Distilling Company, Milwaukee; one 125 kw. generator for the Big Muddy Coal & Iron Company, Murphysboro, Ill.; one 100 kw. generator for the Keystone Leather Company, Camden, N. J.; seventeen motors for the Norfolk Navy Yard; one 50 kw. and one 75 kw. engine type generators for the new Windsor Arcade Building, New York; two 75 kw. engine type generators for the new City Prison, Blackwell's Island; two 100 kw engine type generators for the Manhattan State Hospital, Central Islip, and two 300 kw. 500 volt street railway generators for the Central States Construction Company, Chicago.

THE TELEPHONE WORLD.

Taxing Telephone Companies

In Louisiana the plan followed by the State Assessor in telephone taxation appears to have been to tax the Bell interests \$100 per mile for lines having copper wire and \$50 per mile for lines with common wire, and to let the taxation of the independent lines range from \$8.33 to \$90 per mile, all this in addition to the taxation of plants, etc. In Arkansas telephone companies are assessed by the county assessors in the respective counties in which their lines are built, and there is no State tax. This is the custom in Florida, though in the latter State telegraph lines are assessed by the State, and the last assessment on nine telegraph companies shows an aggregate value of \$259,317.40. The aggregate value of all the telephone lines in Florida assessed by county assessors during the year 1900 is \$4,000.

In Georgia, prior to the meeting of the present Legislature, telephone companies were required to make returns of their property to the local tax collector in each county in the State. But under the new law telephone companies are now required to make sworn returns to the Controller General. All laws levying State taxes apply equally to resident and non-resident telephone companies, and the property of both are taxed the same as the property of individuals. No report has yet been made covering the assessment of telephone companies in Georgia. In Colorado all telephone companies are assessed by the State board of equalization, and are required by law to file annual reports with the board.

The Postal District Messenger Company, with a capital of \$10,000, filed articles of incorporation last week in the office of the county clerk of Hudson County, N. J. The articles provide that the business of the concern may be conducted in every State, territory and colony of the United States. The company is incorporated to include the business of a common carrier and construct telegraph and telephone lines. The capital stock is fixed at \$10,000, and the local agent of the company is Aaron C. Ackerman of 99 Montgomery street, Jersey City. The incorporators are W. H. Baker, Charles P. Brush and John O. Stevens, all of the Postal Telegraph & Cable Company.

An automatic device threatens to take work away from the telephone operators, says a daily paper. A new apparatus, the invention of a Providence, R. I., electrician, is being built in Forestville, Conn., and if efficient, will enable every telephone subscriber to make his own connection. New York and Boston capitalists are behind the enterprise. Every telephone is to be fitted up with a miniature exchange, and only when longer distances are wanted will central have to be called upon. The new device is called the auto-commutator. Connection is made by setting the hands of a dial until they point to the number wanted. Then a plug is inserted, and the connection is made.

For some years there has been a small local telephone line doing business in Monrovia, Cal., but of late the Sunset line, which covers all of Southern California, has been cutting rates in a contest with the local line. The latter, known as the Juvinall system, is now being reorganized, with a view to covering a number of small towns in that section, and it is reported that considerable capital has been interested in the building of extensions of the line.

The farmers of Lake View, Ia., have organized a telephone company because of the difficulty with the Bell Company. Several of the farmers will have phones in their residences. No charge will be made to the public for the use of the exchange, which will be located at Lake View. Connection will be made with Odebolt, Sac City, Early and Wall Lake. Charles Irwin has been elected president and B. Broughton secretary.

Secretary of State Morton recently granted a charter to the Union Telephone Company of Macon County, Tenn., with \$5,000 capital stock. The incorporators are: H. C. Smith, H. N. Donoho, John B. Dalton, A. W. Wakefield, E. K. Lamb, L. L. Simmons and H. H. Carter.

The Southwestern Telegraph & Telephone Company of Hallettsville, Tex., is making extensive improvements in its system. A new and large switchboard is being put in and the wires are all being placed in lead cables.

The people in Cartersville, Mo., want to be connected with the rest of the world by long distance telephone.

The De Kalb County Telephone Company of Sycamore, Ill., has increased its capital stock from \$15,000 to \$50,000.

A. C. Moore of Tampa, Fla., desires to correspond with manufacturers of equipment for a telephone exchange.

Combination of Independent Companies.

In connection with the proposed consolidation of the independent telephone companies of the country, it is asserted that York, Pa., is to be the headquarters of the concern and that several capitalists of that city will be among the officials.

It is proposed to erect there an Eastern plant of the American Electric Company of Chicago for the manufacture of telephone supplies. Inasmuch as the Chicago plant cannot supply the demand and because York is practically the center of the Eastern group of independent companies and one of the largest of them, it is believed the plant will be secured for York.

It will be a big concern and employ probably 1,500 hands. Already ground has been offered for the purpose free of cost. Consolidation is expected to take place in a very short time.

The Hudson River Telephone Company, which operates in Albany and the cities and villages of the Hudson River and Mohawk valleys and of Northeastern and Southern New York and Southern Pennsylvania, on March 7, filed with the Secretary of State a certificate of increase of capital stock from \$3,000,000 to \$4,000,000. The additional capital will be employed in extensions and improvements. The amount of capital stock of the company actually paid in is \$2,854,200, and the amount of its debts and liabilities is \$200,000. At the annual meeting of the company, Walter C. Humstone of New York, superintendent of the Western Union Telegraph Company for the Eastern district, was elected a director of the company to fill a vacancy.

A telephone system, with common barbed wire fences as the means of conducting the voice of the patrons, was placed in use at Pullman, Wash., a short time ago, and is said to work nicely, conversation being held easily over any long-distance telephone line. This entire line, nine miles in length, with four telephones, costs less than \$100. The telephones cost \$12 each in Chicago. The chief expense of building the line was encountered in town, and for two miles out, there being no wire fences that distance. The poles of the electric light company were used for stringing the wire in town.

Articles of incorporation have been drawn up and filed for a local telephone exchange at Callaway, Neb., with John Moran, H. H. Andrews, W. E. Shupp, A. L. Mathews and J. D. Weiland as the incorporators. Mr. Andrews, chief promoter of the enterprise, has already received applications for forty-five telephones and there will be more as soon as the exchange is installed. The extension of the line for 12 or 15 miles into the country in different directions is also contemplated with stations at convenient intervals, placing the farmers in close touch with the market reports, and will be a benefit to them in many ways.

What is apparently the opening of a long contest between the Southern New England Telephone Company and New Britain, Conn., occurred recently. The city has a telephone instrument in the old city building and asked the telephone company to remove it to the new city building. The company declined to do so on the ground that it would have to put its wires into the subway. To this the company is opposed. The telephone company has kept very quiet throughout the subway agitation, but is understood to be opposed to taking the step, which the city will insist shall be done.

An effort is being made by some of the business men in Delhi, N. Y., to establish a free telephone service between Delhi and the station, a distance of two miles. The instruments, material and other work are estimated not to cost more than \$50.

Amended articles were lately filed by the Tri-City Telephone Company of Clinton, Ia. The capital is increased from \$35,000 to \$90,000.

Arrangements are nearly completed to put in a telephone exchange at Cass Lake, Minn., which will be connected with the long distance system.

The Iowa Telephone Company has lately placed an order for \$50,000 worth of copper wire for use in repairing its long distance lines throughout the State.

Last week the Northwestern Ohio Telephone Company increased its capital stock from \$30,000 to \$40,000. P. J. Lenhart is the president and F. J. Spencer, secretary.

The Ravenna Home Telephone Company of Ravenna, O., has increased its capital stock from \$10,000 to \$20,000.

R. B. Middlebrook, city counselor, in Kansas City, Mo., has finished his examination of the various telephone laws of the country and is now prepared to bring proceedings to enforce the new Kansas City law which allows the telephone company to charge only \$48 and \$30 for its service. Mr. Middlebrook declined to make known just what policy he would pursue in bringing action against the telephone company, but he said that he was ready to begin at any time. It is not known whether the proceedings will be in the nature of a mandamus or a common arrest through the channels of the police court. The question of cheap telephone rates will undoubtedly go to the Supreme Court before the litigation is over. The telephone company holds that the law cannot be enforced and will consequently contest it.

At a recent meeting all arrangements were completed for placing the independent telephone companies of Western Maryland, Pennsylvania, Virginia and West Virginia under a single management. Later the plans will be extended to include all the Western States, and the committee expresses the belief that the result will eventually be a telephone service able to compete with the Bell system. The capitalization will be at least \$2,000,000. There will be a long distance service to New York, Philadelphia and Baltimore.

News from Deadwood, S. D., states that the Harrison Telephone Company will extend its line to the Southern Hills towns this spring. At present it reaches all of the towns in the Northern Hills, and as far south as Rapid City. It will be extended to Keystone, Hill City, Custer and Hot Springs, which will give it the same circuit that the Black Hills Telephone Company has. The latter company has put in a station at Oreville. The Black Hills, it is claimed, has the most complete telephone service in the West.

The People's Independent Telephone Company, which has plants in Niagara Falls, Tonawanda, Medina, Albion, N. Y., and other places, has applied to the village trustees for a franchise in Warsaw of this State. It names \$16 as the top price for residences and \$30 for business places, all service to be on single metallic circuits.

A new telephone line is being built from Farber to Hutchinson, Mo., a distance of 11 miles. The company was organized by electing R. E. Sisk, president; W. J. Crow, vice-president; C. A. Davault, secretary, and William Lake, treasurer, and is known as the Farber Telephone Company.

The Home Telephone Company of Cortland, N. Y., has ordered two new sections for its switchboard to make room for 200 more phones. The plant was originally intended for 400, but the large number of subscribers has already made an increase in the plant necessary.

At a recent meeting of prominent citizens of Alnsworth, Neb., it was decided to organize a telephone company to construct a line from Alnsworth to Springfield and Norden. Over \$1,500 was subscribed and the work will begin at once.

E. W. Coleman has completed the payment of \$10,000 for a telephone franchise in Louisville, Ky., and the general council will authorize the construction of an independent system.

The Astoria, Ore., council has passed an ordinance to place a license of 10 cents per month on each telephone operated in that city.

Oliver Springs, Tenn., has a telephone exchange completed and in operation.

TELEPHONE INCORPORATIONS.

The Union Mutual Telephone Company, Union, Ia. Capital stock, \$2,000.

The Houston Telephone Company, Golden, Ill. Capital stock, \$2,500. Incorporators: T. J. Downing, E. J. Hedrick and others.

The Southwestern Telephone Company, Beaumont, Tex. Capital stock, \$50,000. Incorporators: Lawrence Harrison, T. C. King and S. E. Chapan.

The Preston Bend Telephone Company, Preston, Tex. Capital stock, \$5,000. Incorporators: A. G. Noble, Hamp Willis, R. A. Owen and J. T. Watkins.

The Farmers & Merchants' Union Telephone Company, Griggsville, Ill. Capital stock, \$2,500. Incorporators: Angus N. Orr, Adam Zimmerman and J. W. Orr.

The Gladbrook Telephone Company, Gladbrook, Ia. Capital stock, \$10,000. Incorporators: Samuel B. Montgomery, J. A. Davis, Aldine R. Kroh and Fred W. Browne.

GENERAL ELECTRICAL NEWS.

Lighting.

Algood, Tenn.—This place is making an effort to secure an electric light plant.

Bolivar, Mo.—The citizens have decided to erect an electric light plant.

Brigham, Utah.—Articles of incorporation of the Brigham Light & Power Company were lately filed. The object is to establish and operate an electric light and power plant here. The capital stock is placed at \$20,000. H. M. Ogle is president and treasurer of the company.

Brownsville, Tenn.—The Brownsville Electric Light Company will rebuild its power house lately destroyed by fire. J. Clinton, secretary.

Canton, O.—The Canton Light, Heat & Power Company of Canton has increased its capital stock from \$150,000 to \$225,000. Extensive improvements are to be made to the plant so as to increase its capacity and efficiency.

Cartersville, Ga.—The Eyowah Milling Company of this place contemplates the erection of an electric light plant.

Clayton, Ala.—This city will issue bonds for an electric light plant.

Clear Lake, S. D.—This town is preparing to erect an electric light plant.

Concord, N. H.—A movement has been started to erect an electric light plant here.

Cove, Ore.—The citizens of this place are discussing the question of erecting an electric light plant.

Culpeper, Va.—This city will erect an electric light plant. Address the mayor.

Edinborough, Pa.—At the next meeting of the council Hon. F. L. Hoskins and Hon. P. A. Gibson will ask for a franchise to erect an electric light plant here.

Emporia, Va.—W. F. Deal has been granted a franchise to erect an electric light plant here.

Fairfax Va.—R. C. L. Moncure and others have chartered a \$5,000 company to establish an electric lighting plant.

Hagerstown, Ind.—S. Shafer, representing Muncie capitalists, is here to establish a new electric light plant, providing a sufficient number of subscribers can be secured.

Hearne, Tex.—The Planters' Oil Company is in the market for a 125-light dynamo.

Holly, Mich.—The electric light company has announced a reduction of 33 $\frac{1}{3}$ per cent. in the price of electricity.

Huntington, Ark.—The Huntington Electric Light & Power Company, with a capital of \$8,000, has been chartered here by M. Hayes, H. F. Rogers and others.

Kokomo, Ind.—Twenty of the leading business men of this place have organized an independent electric light company and will at once begin the erection of a new plant here.

Mansfield, O.—The question of the issue of \$65,000 bonds to provide funds for the establishment of a municipal electric lighting plant in connection with the sanitary plant now in process of construction here will be voted on at the coming election.

Marion, Ala.—Messrs. Lide, Wilbourne & Hurt is the company that received a franchise to put in an electric light plant here. Address J. Hurt.

Plainfield, Ill.—The citizens are agitating the question of erecting an electric light plant.

Oxnard, Cal.—This place is to have an electric light and power plant.

Paragould, Ark.—This city wants proposals for the erection of an electric light plant. J. A. Morgan is chairman of the committee that has the matter in hand.

Roanoke, Ala.—This city will issue bonds for the erection of an electric light plant.

Sabetha, Kan.—The citizens contemplate the erection of a new \$10,000 electric light plant.

Sandersville, Ga.—Holt & Bro. of this place want estimates on an electric light plant.

Stillwater, Okla.—An electric light plant will soon be built here.

Suffolk, Va.—N. M. McAnge, chairman of the com-

mittee of Suffolk, will open bids March 15 for the municipal lighting of the streets and buildings.

Trenton, Mich.—The question of erecting an electric light plant here is being discussed.

Wapella, Ill.—The question of erecting an electric light plant is being agitated by the citizens of this place.

West Nashville, Tenn.—The West Nashville Light & Power Company, with a capital of \$15,000, has been chartered by M. G. Cockrill, L. H. Davis and others to build a light and power plant.

Street Railways.

Annadale, N. Y.—The Richmond Beach Railway Company was lately incorporated with a capital stock of \$30,000, to operate a steam or electric line from Arbutus Lake to tracks of the Staten Island Rapid Transit Railroad near this station.

Ashmore, Ill.—The project of constructing an electric railway from Oakland to this place via Spring Lake and Newman is being promoted by Coles County capitalists headed by State Senator S. C. Pemberton, Judge Winkler and others.

Auburn, Me.—An electric road is projected between here and Canton, a distance of 22 miles. It would pass through Turner, North Turner and Britton's Mills.

Belleville, Mich.—This village has granted a franchise for an electric railroad through this township to George H. Waldo of Detroit.

Buffalo, N. Y.—The machine shop of the International Traction Company was completely destroyed by fire last week. The loss is about \$50,000, including \$40,000 worth of valuable electric machinery which was in the structure.

Dowagiac, Mich.—The city council has granted a 30-year franchise to the Lake Michigan & Eastern Railway to build and operate electric lines in and through this city, the same to be in operation within two years.

Dundee, N. Y.—The project of an electric road from here to Bradford by way of Crystal Springs, Keuka, Wayne, Weston and Tyrone is being agitated.

Flushing, N. Y.—It is authoritatively stated that the Jackson avenue trolley line of the New York & Queens County Railroad is to be built during the coming spring.

Lawrence, Kan.—This city has granted a franchise to L. M. Erb of New York for an electric street railway.

Marysville, O.—The Richwood, Marysville & Columbus Electric Railroad Company was lately incorporated for \$10,000 by F. G. Fullington, W. King and R. L. Woodburn. The company will build an electric railway from Byhalia to Columbus.

Montgomery, Ala.—The proposition to build an electric railway from here to Selma is a go, says Frank Baltzell, one of the promoters in this city.

Olivet, Mich.—Application has been made to the council to grant a 30-year franchise to D. D. Ford to build an electric railway through this village. The road will connect Battle Creek with Lansing.

Painesville, O.—C. W. Goodrich and P. W. Tuttle of Geneva and L. B. Stanley of Collinwood, promoters of the Painesville-Geneva electric line, have been granted a franchise through Lake County by the county commissioners.

Warren, O.—It was learned recently that several men are at work getting the right-of-way for an electric line between here and Garrettsville, by way of Leavittsburg. The line will be the last link in a Cleveland-Pittsburg connection. It is believed that Cleveland and Youngstown men are back of the movement.

Washington, Ind.—Z. F. Graham, owner of the street railway system in this city has announced that he would build an electric line to Loogootee, 17 miles east of here. It will pass through two towns. Several Cincinnati capitalists are interested. The estimated cost of building the line is \$120,000.

Xenia, O.—The council has voted in favor of an ordinance giving the J. P. Martin traction line the right of way through this city.

Manufacturing.

Anderson, Ind.—The Anderson Tool Company of this city, has lately been incorporated with a capital stock of \$50,000. The new company will manufacture tools, lamps, electrical tools and small machinery. Charles Eastman, C. W. Hooven, J. A. Van Osdol, T. N. Stilwell, Edward S. Lea, George Lilly, J. E. Johnson and F. W. Makepeace are the directors.

Birmingham, Ala.—The Hardie-Tynes Foundry & Machine Company is in the market for a 65 kilowatt generator, one 20 horse power electric motor and two 5 horse power motors.

Cleveland, O.—A number of sanitariums will be established in various cities, where patients can be treated for consumption. This city will be the headquarters. The Brush Electric Company will manufacture the apparatus.

Company Matters.

Brooklyn, N. Y.—At the meeting of the newly-elected directors of the Edison Electric Illuminating Company of this city, held last week, the following officers were elected for the ensuing year: President, A. N. Brady; first vice-president, A. M. Young; second vice-president, William Berri; secretary, W. W. Freeman; treasurer, A. W. Dater; assistant treasurer, A. N. Nielsen.

Toronto, Ont.—The annual general meeting of the shareholders of the Holmes Electric Protection Company of Toronto, Limited, was held recently. The report presented by the directors to the shareholders was a very satisfactory one, showing marked progress for the past year.

Power and Transmission.

Duluth, Minn.—The Highland Canal & Power Company has filed its papers in condemnation proceedings for a water power canal 50 miles long, designed to deliver at the head of the hill above this city water that will generate 100,000 horse power electrical energy every 24 hours at the meters of consumers in the city and at Superior.

Salinas, Cal.—It is reported that the Slack Canyon Coal Mining Company will soon put in a power plant. This plant is designed to furnish power and light to this city and all towns south as far as Santa Barbara. It is the intention of the company to put up an immense power plant at the mines and use compressed coal dust for fuel.

Automobiles.

Chicago.—The Illinois Electric Vehicle Company, operating 100 auto cabs, has decided to go out of existence. According to one of the officials of the company, the affairs of the organization will be wound up at the next annual meeting of the stockholders on April 6. Among the directors of the company are John J. Mitchell, Robert T. Lincoln, C. K. G. Billings, P. A. B. Widener, Harry Payne Whitney and E. L. Brewster.

San Juan, Porto Rico.—Boston men with capital recently formed a company called the San Juan Transportation & Trading Company. It is the purpose of this concern to operate an automobile line from the port of Ponce to the city of Ponce, a distance of three miles, and also a city line from San Juan to Morro Castle and the various resorts. It is expected that the tourist travel to the island will be greatly increased, and that this will add to the business.

Toledo, O.—Articles of incorporation were lately filed with the secretary of state by the Toledo Automobile Company, with a capital stock of \$25,000. F. E. Southard, E. P. Hubbell, E. G. Eager and C. M. Hall are among those interested. The business will be confined solely to automobiles and repairing of machines. Steam, electric and gasoline vehicles will be carried in stock, also electric hansom, carriages and opera wagons.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Author's'd	Issued.					Author's'd	Issued.				
Albany, N. Y.—Mar 12						Hartford Conn.—Mar 12					
United Traction.....	100	\$5,000,000	\$5,000,000 1% X Q.	109	110	Hartford Street Ry. Co.....	100	\$4,000,000	\$200,000 3% S. Oct.	109	—
(Consolidation of the Albany and Troy City Railway.)						Hartford & West Hartford RR.....	100	1,000,000	247,000	—	—
Allentown Pa.—Mar 12						Holyoke Mass.—Mar 12					
Allentown & Lehigh Val. Trac Co.....	....	4,000,000	1,800,000	—	15	Holyoke Street Ry. Co.....	100	600,000	600,000 3% A. June.	207 1/2	208
Bridgeport, Conn.—Mar 2 :						Hoboken N. J.—Mar 12					
Bridgeport Traction Co.....	100	2,000,000	2,000,000 1% X Aug.	100	—	North Hudson Co. (N. J.) Ry. Co....	25	1,250,000	1,000,000 8% X,	100	—
Baltimore Md.—Mar 82						Indianapolis, Ind.—Mar 12					
United Railways & Elec. Co.....com.	50	24,000,000	12,000,000	16	16 1/2	Indianapolis Street Ry.....	....	5,000,000	5,000,000	27	29
Boston, Mass.—Mar 12						Lancaster, Pa.—Mar 12					
New England Street Ry.....	25	5,000,000	1,051,235 1% X Q. Jan. 15,	—	—	Pennsylvania Traction Co.....	100	10,000,000	9,900,000	—	—
North Shore Traction Co.....com.	100	4,000,000	4,000,000	15	15	Lancaster & Col. Electric Ry.....	....	—	87,500	—	—
North Shore Traction Co.....pfd.	100	2,000,000	2,000,000 3% S. A. & O.	85	87	West End Street Railway.....	....	—	—	—	—
West End Street Ry. Co.....com.	50	10,000,000	4,000,000 3% S. A. & O.	112	112 1/2	Louisville, Ky.—Mar 12					
West End Street Ry. Co.....3% pfd.	50	4,000,000	4,400,000 4% S. Jan.	108 1/2	109	Louisville Ry.....com.	100	4,000,000	8,500,000 1% X, April.	82	88
Boston Elevated R. R.....	100	10,000,000	—	108 1/2	109	Louisville Ry.....pfd.	100	2,500,000	2,500,000 2% X S. Oct. 1.	112	118
Brooklyn N. Y.—Mar 12 :						Minneapolis, Minn.—Mar 12					
Brooklyn City Ry.....	100	2,000,000	1,928,400	285	240	Twin City Rapid Transit.....com.	100	17,000,000	15,010,000	—	—
Brooklyn Rap. Transit Co., Inc. cert.	100	48,000,000	48,000,000	78	78 1/2	Twin City Rapid Transit.....7% pfd.	....	8,000,000	1,712,300 1% X, Oct.	186	187 1/2
Brooklyn Heights Railroad.....	100	200,000	200,000	107	109	Montreal, Canada.—Mar 12					
Brooklyn City RR.....guar.	100	12,000,000	12,000,000 8% X Q. Jan.	207	209	Montreal Street Ry. Co.....	50	4,000,000	4,000,000 8% S. M. & N.	263 1/2	265
Brooklyn, Queens Co. & Sub. RR.....	100	2,000,000	2,000,000	—	—	Toronto Street Ry. Co.....	100	6,000,000	8,000,000 1% X S. J. & J.	106 1/2	109 1/2
Coney Island & Brooklyn RR.....	100	2,000,000	1,884,300 2% X Nov., '99.	235	232	Memphis Tenn.—Mar 12 :					
Kings County Elevated.....	100	4,750,000	4,750,000	—	—	Memphis Street Railway Co.....	100	800,000	900,000	25	—
Kings County Traction Co.....	100	4,750,000	4,750,000 1% X July	—	—	New Haven, Conn.—Mar 12 :					
Nassau Electric Railroad.....pfd.	50	6,000,000	6,000,000	75	80	Fair Haven & Westville RR.....	25	2,000,000	2,000,000 8% S. Sept.	99	41
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000	—	—	New Haven Street Railway Co.....	100	1,250,000	1,000,000 2% X A. July	—	—
Brooklyn, B. & W. R. Railroad.....	....	1,000,000	1,000,000	—	—	New Haven & Centerville.....	100	700,000	800,000	—	—
Buffalo N. Y.—Mar 12						Winchester Avenue RR.....	25	1,000,000	600,000	45	46
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	74	75	New Orleans, La.—Mar 12					
Buffalo Railway Co.....	100	6,000,000	5,870,500 1% X Q. Dec., '99.	99	100	Canal & Claiborne RR. Co.....	40	240,000	240,000 4% S. July	—	—
Columbus O.—Mar 12						New Orleans & Carrollton RR.....	100	1,200,000	1,200,000 1% X Q. Oct.	148 1/2	150
Columbus Street Railroad.....	100	2,000,000	2,000,000 1% X Q. Feb.	86	89	New Orleans Traction Co new com.	100	—	—	22 1/2	24
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000	92	92	New Orleans Traction Co new pfd.	100	—	—	95	96
Charleston, S. C.—Mar 12						Orleans City RR.....guar.	100	2,000,000	2,000,000 8% S. Jan.	20 1/2	20
Charleston City Ry. Co.....	50	100,000	100,000 8% S.	—	—	Orleans & Lake RR.....guar.	100	2,000,000	2,000,000 4% S. Jan.	—	—
Enterprise City RR. Co.....	25	1,000,000	250,000	—	—	Orleans Railroad.....	50	500,000	185,000 1% X, June.	—	58
Chicago, Ill.—Mar 12						St. Charles Street Railway.....	50	1,000,000	1,000,000 1% X, Oct.	56 1/2	57
Chicago City Ry. Co.....	100	12,000,000	12,000,000 8% X Q. Dec. 31, '99.	255	260	New York—Mar 12 :					
Chicago & South Side R. T. RR.....	100	10,228,800	10,228,800	—	—	Central Croton RR.....	100	600,000	600,000 2% X Q.	255	300
Lake Street Elevated RR.....	100	10,000,000	10,000,000	94	10	Christopher & 10th St. RR. guar.	100	650,000	650,000 2% X Q. Oct.	175	185
Metropolitan West Side Elev. Ry....	100	15,000,000	7,000,000 Feb 25 1900.	82 1/2	83	Dry Dock, E. Bldg'ry & Battery RR.	100	1,200,000	1,200,000 1% X Q. Nov.	120	125
Met. West Side El., pfd.....	100	15,000,000	9,000,000	79	80	Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000 2% X Q. Feb. 1900.	16 1/2	16 1/2
North Chicago Street RR.....	100	10,000,000	6,600,000 8% X Q. Jan.	208	210	Eleventh St. & Fulton F. Ry. guar.	100	900,000	900,000 1% X A. July.	85	87
South Chicago City RR.....	100	500,000	249,900	197	200	Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000 2% X Q.	262	240
West Chicago St. Ry. Co.....	100	2,000,000	1,608,200	99 1/2	100	Gen. Park, N. & E. Rivers RR. guar.	100	1,800,000	1,800,000 2% X Q.	192	200
Union Traction Ry.....com.	100	20,000,000	12,189,000 1% X Q. Feb.	104 1/2	106	Eleventh Avenue RR.....	100	1,000,000	1,000,000	890	405
Union Traction Co.....pfd.	100	1,250,000	624,900 5% S.	15	15 1/2	42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000 4% X Q.	892	405
Cincinnati, Ohio.—Mar 12 :						Ninth Avenue RR.....guar.	100	800,000	800,000	198	201
Cincinnati Inc. Plane Ry.....com.	50	1,000,000	975,000	—	—	Sixth Avenue RR.....guar.	100	2,000,000	2,000,000	205	225
Cincinnati Inc. Plane Ry.....pfd.	50	150,000	150,000	—	—	Twenty-third St. R. R. Co. guar.	100	600,000	600,000 4% X Q.	400	410
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000 3% X Feb.	75	76	Second Avenue RR.....	100	2,500,000	1,862,080 2% X Q. Jan.	198	201
Windsor Street Ry. Co.....	50	15,000,000	14,000,000 1% X Q. Jan.	124 1/2	125	Third Avenue RR.....	100	12,000,000	10,000,000 \$1.75 p. sh. Feb.	121	121 1/2
Mt. Adams & Eden Park Inc. Ry.....	50	2,500,000	2,300,000 1% X Q. Jan.	126 1/2	127	42d St. Manhatt'n & St. Nich. Av	100	2,500,000	2,500,000	65	75
Cleveland, Ohio.—Mar 12 :						Union (Huckleberry) Ry.....	100	2,000,000	2,000,000	190	200
Arcon, Bed. & Elev. Elec. Ry.....	100	1,000,000	1,000,000 3% X Jan.	48	50	Newark N. J.—Mar 12					
Cleveland City Ry.....	100	8,000,000	7,600,000 5% X Jan.	102	103 1/2	Consolidated Traction Co. of N. J....	100	15,000,000	15,000,000	62	62 1/2
Cleveland Electric Ry.....	100	12,000,000	12,000,000 3% X Q. Oct., '99.	88	84 1/2	North Jersey Railway Co.....	100	6,000,000	6,000,000	24 1/2	26
Detroit, Mich.—Mar 12						United Elec. Co. of New Jersey..	100	504,000	504,000 1 1/4% X A.	22	24
Detroit Citizens' Street Ry.....	100	2,000,000	1,280,000	100 1/2	—	Pittsburg, Pa.—Mar 12					
Fl. Wayne & Belle Isle Ry.....	100	—	1,280,000	175	—	Allegheny Traction Co.....	50	500,000	500,000	27	28
Rapid Railway Co.....	100	250,000	250,000	80	100	Consolidated Traction Co.....com.	50	15,000,000	15,000,000 2% X Jan.	25 1/2	26
Detroit Electric Railway.....	100	1,000,000	1,000,000	—	—	Consolidated Traction Co.....pfd.	50	9,478,850	9,478,850 1 1/4% X Nov.	65	66
Windsor & Detroit River Ry.....	100	250,000	250,000	100	110	Central Traction Co.....	50	1,500,000	1,500,000 1 1/4% X Nov.	72 1/2	74
Dayton O.—Mar 12						Citizens' Traction Co.....	50	8,000,000	8,000,000 5% X A.	—	—
City Railway Co.....com.	100	1,500,000	1,470,000 1% X Q.	140	145	Duquesne Traction Co.....	50	8,000,000	8,000,000 5% X A.	—	—
City Railway Co.....pfd.	100	600,000	600,000 1% X Q.	170	—	Pittsburg Traction Co.....	50	2,500,000	2,500,000 8% X, Nov.	—	—
People's Street Railway.....	100	1,100,000	1,100,000	114	115	Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000 2% X, July.	27	29

* Unlisted. † Ex-div.
 a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.
 b Leased to Boston Elevated Railroad Company.
 c Owned by Brooklyn Rapid Transit Company.
 d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
 e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
 f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
 g Owned by Atlantic Ave. RR. and leased to Nassau system.
 h \$80 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; \$250 100 of stock owned by North Chicago Street Railroad Company.
 i Controls by lease Chicago West Division Railway, Chicago Passenger, Railway, and West Chicago Street Railroad Tunnel Company.
 j 35% per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,100 of stock owned by West Chicago Street Railroad Company.
 k Majority of stock owned by Chicago, West Division Railway Company; 5% on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
 l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex-div.
 a Leased to New Orleans Traction Company at 6% on stock.
 b Leased to New Orleans Traction Company at 8% on stock.
 c Leased to Central Croton Railroad at 8% on stock and interest on bonds.
 d Operating the former Met. Trac. system, that corporation having become extinct.
 e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
 f Leased to Houston, West Street & Poyonia Ferry—now Metropolitan Street Railway.
 g Leased to Metropolitan Street Ry. at 8% on stock until Oct. 1, 1897; thereafter 9%.
 h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1893, at \$215,000 per annum.
 i Leased to Metropolitan Street Railway for 18% on stock.
 j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6% first 5 years, 8% thereafter.
 k Leased to Metropolitan Street Railway for \$145,000 per annum.
 l Leased to Metropolitan Street Railway for 18% on capital stock.
 m Controlled by Third Avenue Railroad by purchase.
 n Dividends of 1 1/4% yearly guaranteed by Consolidated Traction Company.
 o Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.
 p Leased to Consolidated Traction Company for 8% per annum on par value of stock.
 q Leased to Fort Pitt Traction Company for 6% on \$3,000,000 capital stock.
 r Leased to Consolidated Traction Company for 4% on capital stock.
 s Leased to Consolidated Traction Company for 7% on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Capital Stock.		Rate and Date of Last Div.	Bid.	Asked.	NAME.	Capital Stock.		Rate and Date of Last Div.	Bid.	Asked.
	Par	Authorized					Par	Authorized			
New Bedford Mass.—Mar 12	100	\$800,000	\$800,000	2 %	Feb.	160	165				
Union Street Railway Co.	100	800,000	225,000	4 %	A., June.	170	178				
Northampton, Mass.—Mar 12	100	5,000,000	5,000,000	3 %	A. and N.	55	65				
Northampton Street Ry.	100	1,250,000	1,250,000			54	—				
Omaha, Neb.—Mar 12	100	8,000,000	8,000,000	3/4 %	Oct. '98	110	111				
Omaha Street Ry.	100	2,000,000	1,770,000	2 %	Dec. '98	28	24				
Paterson, N. J.—Mar 12	100	1,966,100	1,966,100	2 1/2 %	July 15, '99	47	48				
Paterson Ry. Co.	100	588,900	588,900	8 %	July, '99	75	76				
Providence, R. I.—Mar 12	100	800,000	800,000	3 %	Feb. 1, '99	75	76				
United Traction & Electric Co.	100	80,000,000	29,980,450			82 1/4	34				
Philadelphia.—Mar 12	50	500,000	192,500	\$3 share Q.		345	—				
Fairmount Park Trans. Co.—\$50 pd.	50	1,000,000	1,000,000	\$14 share A—Apr '98	450	451					
Hestonville, Man. & Fairmount	50	1,000,000	1,000,000	A. & O.	90	90					
Hestonville, Man. & Fairmount	50	1,000,000	1,000,000	\$9 share A, Mar. '98	300	300					
Union Traction Co.—\$12 1/2 pd.	50	1,000,000	1,000,000	8 %	A., April, '98	150	151				
Electric Traction Co.	50	1,000,000	1,000,000	8 %	Jan., 1898	151	152				
Frankford & Southwark Pas. R.	50	1,000,000	1,000,000	\$2 p. sh., Oct. '98	100	100					
Lehigh Avenue Ry. Co.	50	1,000,000	1,000,000	6 % A—Mar. '98	158	157					
Lombard & South Street Ry.	25	1,000,000	1,000,000	\$6 share—July, '98	158	157					
Second & Third Streets Ry.	50	1,000,000	1,000,000	\$7.50 share July '98	208	208 1/4					
People's Traction Co.	50	1,000,000	1,000,000	\$8.50 share July '98	100	100					
Germantown Passenger Ry.	50	1,000,000	1,000,000	\$12 share July '98	308 1/4	309					
Green & Coates Passenger Ry.	50	1,000,000	1,000,000	\$2 share July '98	100	100					
People's Passenger Ry.—com.	25	1,000,000	1,000,000	\$1 share July, '98	—	—					
People's Passenger Ry.—pfd.	25	1,000,000	1,000,000	\$1 share July, '98	—	—					
Philadelphia Traction Co.	50	1,000,000	1,000,000	\$11 sh. A., July, '98	800	800					
Catherine & Bainbridge St.	50	1,000,000	1,000,000	\$9.50 shre, July '98	289	289					
Continental Pass. Ry.—guar.	50	1,000,000	1,000,000	\$10 share, July '98	262	262					
Empire Passenger Ry. Co.	50	1,000,000	1,000,000								
Philadelphia City Pass. Ry.	50	1,000,000	1,000,000								
Philadelphia & Gray's Fy. RR.	50	1,000,000	1,000,000								
Ridge Avenue Passenger Ry.	50	1,000,000	1,000,000								
Philadelphia & Dart. Ry. guar.	50	1,000,000	1,000,000								
17th & 19th Sts. Pass. Ry. guar.	50	1,000,000	1,000,000								
Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	1,000,000								
Union Passenger Ry. Co.	50	1,000,000	1,000,000								
West Philadelphia Pass. Ry.	50	1,000,000	1,000,000								
Rochester, N. Y.—Mar 12	100	5,000,000	5,000,000			20	23				
Rochester Railway Co.	100	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26					
Reading, Pa.—Mar 12	50	850,000	850,000	Jan., '98	188	—					
Reading Traction Co.	50	1,000,000	1,000,000	Jan., '98	70	—					
St. Louis Mo.—Mar 12	50	800,000	150,000								
Jefferson Avenue Ry. Co.	50	400,000	400,000	2 % Dec., 1888	—	—					
Lindell Ry.	100	2,500,000	2,400,000	1 1/2 % Jan. '99	—	—					
National Railway Co.	—	2,500,000	2,479,000	1 1/2 % Jan. '99	—	—					
Cass Avenue & Fair Grounds	—	2,500,000	2,500,000		—	—					
Olds' RR.	100	2,000,000	1,500,000	4 % Oct., '98	—	—					
St. Louis RR.	100	2,000,000	2,000,000	2 1/2 % Jan., '99	—	—					
Missouri RR. Co.	50	1,000,000	800,000	1 1/2 % Jan., '99	25 1/2	25 1/2					
People's RR. Co.	50	1,000,000	800,000	50c., Dec., '89	78	79					
United Electric Ry.	50	1,000,000	1,000,000	3 % Jan., '99	68	65					
United Electric Ry.—6 % pref.	50	1,000,000	1,000,000	3 % A., July, '99	68	70					
St. Louis & Suburban Ry.	100	2,500,000	2,500,000		—	—					
Union Depot RR.	100	4,000,000	4,000,000		—	—					
San Francisco, Cal.—Mar	100	1,000,000	600,000	50c. monthly.	117	119					
California St. Cable RR.	100	1,000,000	875,000	\$2.50 share, '96	50	—					
Geary Street Park & Ocean RR.	100	18,750,000	18,750,000	\$2.50, 60c. per share.	61 1/2	68 1/2					
Market Street Ry.	100	1,000,000	550,000		16	—					
Presidio & Ferries RR.	100	1,000,000	550,000		—	—					
Scranton Pa.—Mar 12	50	6,000,000	2,500,000		29	30					
Scranton Railway Co.	100	500,000	500,000		16 1/2	—					
Scranton & Carbondale Trac. Co.	100	1,050,000	1,050,000		—	—					
Scranton & Pittston Traction Co.	100	1,050,000	1,050,000		—	—					
Springfield Ill.—Mar 12	100	750,000	750,000		—	—					
Springfield Consolidated Ry.	100	1,000,000	1,000,000		—	—					
Springfield O.—Mar 12	100	1,000,000	1,000,000		—	—					
Springfield Street Ry.	100	1,200,000	1,168,700	8 % A.	207	212					
Toronto Canada.—Mar 12	100	6,000,000	6,000,000	1 1/2 % S.	108 1/2	108 1/2					
Toronto Street Ry.	100	4,000,000	4,000,000	4 % S.	272 1/2	265					
Washington, D. C.—Mar 12	50	500,000	500,000		—	—					
Belt Ry. Co.	100	12,000,000	12,000,000	65c. per sh. Oct. '99	102 1/2	102 1/2					
Capital Traction Co.	50	400,000	400,000	6 % A.	—	—					
Columbia Ry. Co.	50	707,000	652,000		85	40					
Edgington & Soldiers' Home Ry.	50	200,000	200,000		20	21					
Georgetown & Tenallytown Ry.	50	1,000,000	458,900	3 1/2 % Q.	—	—					
Metropolitan RR. Co.	100	8,000,000	8,000,000		8 1/4	35					
Worcester, Mass.—Mar 12	100	2,000,000	2,000,000	3 % S., Feb.	104	105					
Worcester Traction Co.—com.	100	550,000	542,500	4 1/2 % S., 1899	—	85					
Worcester & Suburban Street Ry.	100	5,000,000	5,000,000	1 % Jan.	25	29					
Wilkesbarre, Pa.—Mar 12	100	5,000,000	5,000,000		—	—					
Wilkesbarre & Wyoming Val Trac.	100	5,000,000	5,000,000		—	—					

* Unlisted. † Paid in. ‡ Full paid. § Outstanding. ¶ Ex-div.
 a Leased to Hestonville, Man. & Fairmount Passenger Ry. for 6 % on stock per annum.
 b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
 c Practically all shares owned by Union Traction Company.
 d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
 e Leased to Electric Traction Company.
 f Controlled by Frankford & Southwark Passenger Railway.
 g Leased to People's Passenger Railway at \$5 per share.
 h Majority of stock owned by People's Traction Company.
 i Leased to Union Traction Company.
 j Lease transferred to Union Traction Company.
 k Leased to United Traction Company at a rental of \$10,000 per annum in 1896-7-8, and \$20,000 in 1899-1900 and \$30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.
 l Dividend of 10 % guaranteed by Reading Traction Company.
 m Dividend of 6 % guaranteed by Reading Traction Company.
 n Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

Boston, Mass.—Mar 12	100	50,000,000	28,650,000	4 1/2 % Q., Jan.	159 1/4	160
American Tel. & Tel. Co.	100	10,894,600	10,894,600	1 1/2 % Q., Feb. 20, '99	50	51
Erle Telegraph & Telephone Co.	100	10,894,600	10,894,600	\$1.50 p. sh. Feb.	185	187
New England Telephone Co.	100	14,000,000	14,000,000	1 1/2 % Q.	91	94
New York.—Mar 12	100	6,500,000	6,500,000	1 1/2 % Q.	100	105
American Telegraph & Cable Co.	100	10,000,000	10,000,000	1 1/2 % Q.	178	175
*Central & South Am. Tel. Co.	100	1,000,000	1,000,000	1 1/2 % S.	42	50
*Commercial Cable Co.	100	5,000,000	4,800,000	1 1/2 % Q., Feb.	—	—
Franklin Tel. Co.—2 1/2 % guar.	100	5,000,000	5,000,000	1 1/2 % Q.	116	118
Erle Telegraph & Telephone Co.	100	5,000,000	5,000,000	1 1/2 % Q.	116	118
*Gold & Stock Tel. Co.—guar. 6 %	100	2,000,000	2,000,000	2 1/2 % Q., Jan.	175	180
*International Ocean Tel. Co.—guar. 6 %	100	5,000,000	5,000,000	2 % S.	70	75
Mexican Telephone Co.	100	15,000,000	15,000,000	2 1/2 % S.	—	—
*New York & New Jersey Tel. Co.	25	950,000	559,525	2 1/2 % S.	95	100
*Pacific & Atlantic Tel. Co.—guar. 4 %	25	500,000	500,000	3 % S., Jan., '99	115	—
*Postal Telegraph Cable Co.	100	97,870,000	97,870,000	1 1/2 % Q., Jan. '99	88 1/2	89 1/2
*South & Atlantic Tel. Co.—guar. 5 %	25	—	—		—	—
*Commercial Union Telegraph Co.	25	—	—		—	—
Western Union Telegraph Co.	—	—	—		—	—
† Div. guar. by Postal Tel. Co.	—	—	—		—	—

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

Boston, Mass.—Mar 12								115	125
Fort Wayne Electric trust receipts..	25	.....	.....	.....	.....	.....	.....	15	25
Ft. Wayne Elec Co. T. Sec. Series A.	100	40,000,000	80,460,000	2 % Q., Aug., 1898.	.....	.....	.....	214	214 1/2
*General Electric Co. [old] com.	100	18,276,000	18,276,000	1 1/2 % Q., Apr., 1900	.....	.....	.....	22	28
General Electric Co. [new] .....	.....	.....	.....	.....	.....	.....	.....	65 1/2	65 1/2
T. H. Elec. Co. T. Secur., Series C.	50	.....	146,700	.....	.....	.....	.....	69 1/2	70
Westinghouse Elec. & Mfg. Co. com.	50	4,000,000	3,996,063	1 1/2 % Q., Jan.,	.....	.....	.....	44 1/2	45
Westinghouse El. & Mfg. Co. pfd.	50	11,000,000	8,198,126	.....	.....	.....	.....	.....	.....
Westinghouse El. & Mfg. Co. assent.	50	11,000,000	8,198,126	.....	.....	.....	.....	.....	.....
New York.—Mar 12									
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	.....	.....	.....	.....	119	120
*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1 1/2 % Oct., '98.	.....	.....	.....	8	12
Edison Ore Milling Co.....	100	.....	.....	.....	.....	.....	.....	.....	.....
Electric Vehicle Co.....com.	.....	.....	.....	.....	.....	.....	.....	.....	.....
*General Electric Co. [old] com.	100	40,000,000	80,460,000	2 % Q., Aug., 1898.	.....	.....	.....	214	214 1/2
General Electric Co. [new]	100	18,276,000	18,276,000	1 1/2 % Q., Apr., 1900	.....	.....	.....	41	.....
Interior Conduit & Insulation Co..	100	1,000,000	1,000,000	.....	.....	.....	.....	.....	.....
| Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	.....	.....	.....	110	135
Pittsburg, Pa—Mar 12									
Allegheny County Light Co.....	100	500,000	500,000	J. & J.	.....	.....	.....	168	172
East End Electric Light Co.....	50	800,000	800,000	Q	.....	.....	.....	.....	.....
Philadelphia, Pa.—Mar 12									
Edison Electric Light Co.....	100	2,000,000	.....	.....	.....	.....	.....	144	144 1/2
*Electric Storage Battery Co...com.	100	8,500,000	.....	.....	.....	.....	.....	73	76
*Electric Storage Battery Co...pfd.	100	5,000,000	.....	.....	.....	.....	.....	73	77
Northern Elec. Light & Power Co..	10	550,000	550,000	.....	.....	.....	.....	19	19 1/2
Southern Elec. Light & Power Co..	10	187,500	187,500	.....	.....	.....	.....	80	.....
Miscellaneous.—Mar									
Bridgeport (Conn.) Elec. Lt. Co....	25	500,000	.....	.....	.....	.....	.....	47	48
Missouri-Edison (St. Louis).....com.	25	.....	.....	.....	.....	.....	.....	20	21
Eddy Electric Mfg. Co.....	25	.....	.....	.....	.....	.....	.....	9	14
Hartford (Conn.) Elec. Light Co....	100	850,000	.....	.....	.....	.....	.....	175	176 1/2
Hartford (Conn.) Lt. & Power Co..	25	175,000	.....	.....	.....	.....	.....	6	19
New Haven (Conn.) Elec. Lt. Co....	100	100,000	.....	.....	.....	.....	.....	195	.....
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	.....	2 % Q., Oct.,	.....	.....	.....	109	104
Rhode Island Elec. Protec. Co.....	100	.....	.....	.....	.....	.....	.....	118 1/2	101
Royal Elec. Co. (Montreal).....	.....	1,200,000	.....	2 % Q.	.....	.....	.....	121 1/2	128
Toronto (Canada) Elec. Light Co....	100	1,085,000	1,085,000	1 1/2 % Q	.....	.....	.....	183	183 1/2
Thomson-Houston Welding Co.....	100	.....	.....	3 % S, Dec. 1,	.....	.....	.....	.....	100
Woonsocket (R. I.) Electric Co....	100	.....	.....	.....	.....	.....	.....	105	108

BONDS.

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bid.	Asked.
	Authorized.	Issued.				
Albany ¹ N. Y.						
Date of Quotation—Mar 12, 1901						
The Albany Ry. Co.....Cons. mtg. 5s.	\$500,000	427,500	1940	J. & J.	117 $\frac{1}{2}$	....
The Albany Ry. Co.....Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*116 $\frac{3}{4}$	....
Watervelt Turnpike & RR. 1st mtg. 6s.	850,000	850,000	1919	M. & N.	*125	....
Watervelt Turnpike & RR. 2d mtg. 6s.	150,000	150,000	1919	M. & N.	*128	....
Troy City Railway Co.....1st 5s	....	....	1942	.....	*114	116 $\frac{3}{4}$
Interest guar. by Albany Ry. Co.						
Principal and interest guar. by Albany Ry. Co.						

Baltimore Md.

Date of Quotation—Mar 12, 1901.

United Electric Ry. Co. 1st mtg. g. 4s.	88,000,000	18,000,000	1949	M. & S.	102%	102%
Income 4s.	14,000,000	.....	1949	J. & D.	74%	75
Baltimore City Pass. Ry. 1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118%	.....
Baltimore Traction Co. 1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
Baltimore Trac. Co. Exten. & Imp. g. 5s.	1,250,000	1,250,000	1901	M. & S.	104%	.....
Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s.	1,750,000	1,750,000	1942	J. & D.	121	121%
Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	.....	1900	J. & J.	101	.....
Baltimore Traction Co. Convertible 5s.	800,000	.....	1906	N. & M.	103%	.....
Central Pass. Ry. Co. 1st mtg. 5s.	96,000	117,000	1912	J. & J.	.....	.....
Central Pass. Ry. Co. Cons. mtg. g. 5s.	604,000	880,000	1982	M. & N.	119	121
City & Suburban Ry. 1st mtg. g. 5s.	8,000,000	8,000,000	1922	J. & D.	116	117
Lake Roland Elev., 1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	.....

All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Mar 12, 1901.

Lynn & Boston RR. 1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry. Deben. g. 5s.	8,000,000	3,000,000	1902	M. & N.	104%	106
West End Street Ry. Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112	.....
†\$1,674,000 in escrow to retire outstanding bonds of absorbed companies.						

Charleston S. C.

Date of Quotation—Mar 12, 1901.

Enterprise Street RR. 1st mtg. 5s.	500,000	47,000	1906	J. & J.	.....	.....
Charleston City Ry. 1st mtg. 5s.	850,000	.....	.....	J. & J.	106	.....
†Controlled by Charleston St. Ry. Co.						

Chicago Ill.

Date of Quotation—Mar 12, 1901.

Chicago City Ry. 1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101%	2%
Chicago Passenger Ry. 1st mtg. 5s.	400,000	400,000	1908	F. & A.	102	.....
Chicago Passenger Ry. Cons. mtg. 5s.	1,000,000	600,000	1929	J. & D.	.....	.....
Chicago & So. Side R. T. 1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	.....	.....
Chicago & So. Side R. T. 2d mtg. g. 5s.	1,500,000	780,000	1907	J. & J.	.....	.....
Chicago West Div. Ry. 1st mtg. 4½s.	4,040,000	4,040,000	1932	J. & J.	108%	109
Lake Street Elevated RR. 1st mtg. g. 5s.	7,574,000	8,781,200	1928	J. & J.	.....	.....
Metrop. W. Side Elev. Ry. 1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96%
North Chicago St. RR. 1st mtg. 5s.	8,171,000	8,171,000	1906	J. & J.	106	.....
North Chicago St. RR. Cert. Indeb. 6s.	500,000	500,000	1911	J. & J.	.....	.....
North Chicago City Ry. 1st mtg. 5s.	500,000	500,000	1900	J. & J.	.....	.....
North Chicago City Ry. consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108	.....
West Chicago St. RR. 1st mtg. 5s.	4,100,000	3,969,000	1928	M. & N.	.....	111
West Chicago St. RR. Deben. 6s.	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR. Cons. mtg. 5s.	12,500,000	6,000,000	1908	.....	109%	107
W. Chicago St. RR. Tunnel. 1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	.....	.....
†Redeemable at option on 60 da. notice.						
†Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.						
†Subject to call after Oct. 1, 1899, at \$110 and interest.						
†Assumed by W. Chi. RR. Co., lessee.						
†Int. guar. by W. Chicago St. RR. Co.						

Cincinnati O.

Date of Quotation—Mar 12, 1901.

Cin. New & Cov. St. Ry. 1st Con. mtg. g. 5s.	8,000,000	2,500,000	1922	J. & J.	114%	115
†Mt. Adams & Eden Pk In. 1st mtg. 5s.	46,000	46,000	1900	A. & O.	108%	104
†Mt. Adams & Eden Pk In. 1st mtg. 5s.	100,000	100,000	1905	A. & O.	108%	.....
†Mt. Adams & Eden Pk Inc. Cons. mtg. 5s.	581,090	581,000	1906	M. & S.	12½%	122½%
So. Cov. & Cin. St. Ry. 1st mtg. 5s.	250,000	250,000	1912	M. & S.	182%	187
So. Cov. & Cin. St. Ry. 2d mtg. 5s.	400,000	400,000	1932	J. & J.	.....	.....
†Assumed by the Cincinnati St. Ry. Co.						
†\$250,000 reserved to retire 1st mtg. bds.						

Cleveland O.

Date of Quotation—Mar 12, 1901.

Brooklyn Street RR. Co. 1st mtg. 5s.	600,000	600,000	1908	M. & S.	106%	107
Cin. New & Cov. St. Ry. Cons. mtg. 5s.	8,000,000	2,500,000	1922	J. & J.	118%	114%
Cleveland City Cable Ry. 1st mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105%	106
Cleveland Electric Ry. Co. 1st mtg. g. 5s.	8,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry. 1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	.....	.....
East Cleveland RR. 1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	107%	.....
Fl. Wayne (Ind.) Elec. Ry. 1st mtg. g. 5s.	900,000	.....	1922	M. & N.	.....	.....
Lorain (O.) Street Ry. 1st mtg. 5s.	200,000	200,000	1915	J. & J.	.....	.....
St. Ry. Co., Grand Rapids. 1st mtg. 5s.	800,000	600,000	1912	J. & D.	.....	.....
†\$1,900,000 in escrow to retire bonds of absorbed companies, marked a.						
Interest guar. by Cons. St. Ry. Co.						

Detroit Mich.

Date of Quotation—Mar 2, 1901.

Detroit Citizens' St. Ry. 1st mtg. 5s.	7,000,000	8,885,000	1905	A. & O.	.....	102%
Fl. Wayne & Belle Isle Ry. 1st mtg. 5s.	400,000	877,000	1902	A. & O.	.....	.....
The Detroit Ry. 1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106%
†\$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.						

New Haven Conn.

Date of Quotation—Mar 12, 1901.

New Haven St. Ry. 1st mtg. g. 5s.	600,000	600,000	1918	.....	111	.....
New Haven (Edgewood Div.) 1st mtg. 5s.	250,000	250,000	1914	J. & D.	111	.....
Winchester Avenue RR. 1st mtg. g. 5s.	100,000	500,000	1912	M. & N.	189	.....
Winchester Avenue RR. Deben. g. 5	100,000	24,000	1912	M. & S.	.....	.....

PASSENGER RAILWAY.

New Orleans La.

Date of Quotation—Mar 12, 1901.

Canal & Claiborne RR. cons. mtg. 5s.	\$150,000	\$150,000	1912	M. & N.	.....	.....
Crescent City RR. 1st mtg. 5s.	.....	50,000	1899	M. & N.	108%	.....
New Orleans City RR. Cons. mtg. g. 5s.	5,000,000	8,000,000	1948	J. & J.	.....	.....
N. Orleans City & Lake RR. 1st mtg. g. 5s.	415,500	899,000	1908	J. & D.	108	112
N. Orleans & Carrollton RR. 2d mtg. g. 5s.	5,000,000	2,599,500	1948	J. & J.	112	118
Orleans Railroad Co. Cons. mtg. 5s.	850,000	850,000	1907	F. & A.	.....	.....
St. Charles St. RR. Cons. mtg. 5s.	800,000	800,000	1912	J. & J.	.....	.....
†\$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.	800,000	75,000	1906	J. & D.	.....	.....
†\$200,000 outstanding.						

New York.

Date of Quotation—Mar 12, 1901.

Atlantic Ave. (Brooklyn).....Imp. g. 5s.	1,500,000	1,500,000	1904	J. & J.	95	.....
Atlantic Av. (Brooklyn) 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107%	110
†Atlantic Av. (Brooklyn).....Cons. mtg. 5s.	8,000,000	1,966,000	1981	A. & O.	115	116
†Broadway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1948	J. & D.	128	125
Broadway & 7th Ave. 1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	106%
Broadway & 7th Ave. 2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110
Broadway Surface. 1st mtg. 5s.	1,125,000	1,125,000	1924	.....	115	117
Brooklyn City RR. Co. 1st cons. cons. mtg. 5s.	1,000,000	1,000,000	1908	.....	105	106
Brooklyn City & Newtown. 1st mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
†Brooklyn Bath & W. E. RR. Gen. mtg. 5s.	1,000,000	448,000	1989	J. & J.	101	.....
Brooklyn Heights RR. 1st mtg. 5s.	250,000	250,000	1941	A. & O.	104	.....
Brooklyn, Q's Co. & Sub'n. 1st mtg. 5s.	8,500,000	8,500,000	1941	J. & J.	112	.....
Brooklyn, Q's Co. & Sub'n. 1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	.....
Brooklyn Rapid Transit. gold 5s.	7,000,000	5,181,000	1945	.....	109%	.....
Bleecker St. & Fulton Ferry RR. 1st mtg. 7s.	700,000	700,000	1900	.....	100%	100%
Cent. Pk. N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Croton RR. 1st mtg. 5s.	250,000	250,000	1922	M. & N.	125	.....
Coney Island & Brooklyn RR. 1st mtg. 5s.	800,000	800,000	1906	J. & J.	101	106
†D. Dock, E. Bd'y & B. Ry. RR. gen. mtg. g. 5s.	1,000,000	980,000	1982	J. & D.	117	120
Dry Dock, E. Bd'y & B. Ry. RR. scrip 5½%	100,000	1,100,000	1914	F. & A.	102	106
Eight Ave. RR. Co. Cert. Indeb. 6½%	.....	1,000,000	1914	F. & A.	108	.....
42d St., Man. & St. Nich. Av. 1st mtg. 6s.	200,000	1,200,000	1910	M. & S.	116%	117
42d St., Man. & St. N. Av. 2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	89	.....
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1998	M. & S.	124	126
Metropolitan St. Ry. Co. g. m. cl. tr. g. 5s.	12,500,000	12,500,000	1997	F. & A.	120	.....
Second Avenue Ry. Gen. cons. mtg. 5s.	1,600,000	1,600,000	1909	M. & N.	120	121
Second Avenue Ry. Deb. 5s.	800,000	800,000	1909	J. & J.	108%	109
Steinway Ry. (L. I.) 1st mtg. g. 5s.	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co. 1st mtg. 5s.	850,000	850,000	1919	.....	110%	112%
Third Avenue RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1987	J. & J.	128%	.....
Twenty-third Street Ry. 1st mtg. 5s.	.....	.....	1909	J. & J.	.....	.....
Twenty-third Street Ry. Deb. 5s.	150,000	150,000	1906	J. & J.	107	108
Union (Huckleberry) Ry. 1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A.	118	116
†Westchester Electric RR. 1st mtg. 5s.	500,000	500,000	1948	J. & J.	110	114
†\$1,085,000 in escrow to retire gen. mtg. bonds.						
†\$4,850,000 in escrow to retire maturing obligations.						
†\$552,000 in escrow to retire 1st and 2d mtg. bonds.						
†In treasury, \$50,000.						
†Guar. by Union Ry. Co.						

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bid.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—Mar 12 19 1.						
Jefferson Avenue Ry.....1st mtg. 5a.	400,000	400,000	1905	M. & N.	108	108
Lindell Ry. Co.....1st mtg. 5a.	1,500,000	1,500,000	1911	F. & A.	108	108
Missouri RR. Co.....1st mtg. 5a.	1,500,000	700,000	1916	M. & N.	108	108
†Mound City RR. Co.....1st mtg. 5a.	400,000	800,000	1910	A. & O.	100	102
People's RR. Co.....1st mtg. 5a.	125,000	125,000	1902	J. & D.	.....	.....
†People's RR. Co.....2d mtg. 7a.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 5a.	1,000,000	800,800	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric 1st mtg. 5a.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 5a.	2,000,000	2,000,000	1900	M. & N.	99%	100%
†St. Louis & Sub. Ry.....1st mtg. g. 5a.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5a.	800,000	800,000	.....	.....	80	84
†Southern Electric Ry.....Cons. mtg. 5a.	500,000	500,000	1909	M. & N.	108	108
†Taylor Avenue St. Ry.....1st mtg. g. 5a.	500,000	500,000	1912	J. & J.	116	118
Union Depot RR. Co.....1st cons. mtg. 5a.	1,091,000	1,091,000	1900	A. & O.	100	100%
Union Depot RR. Co.....Cons. mtg. 5a.	8,500,000	1,787,000	1912	J. & J.	121	123
†Controlled by St. Louis RR. Co.						
†Controlled by Union Depot RR. Co.						
†Controlled by Lindell RR. Co.						
†\$200,000 in escrow to retire 1st & 2d mtg.						
†\$500,000 in escrow.						
†\$200,000 in escrow to retire 1st mtg. 5a.						
San Francisco Cal.						
Date of Quotation—Mar 4 1901.						
California St. Cable RR.....1st mtg. g. 5a.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 5a.	650,000	650,000	1914	M. & N.	.....	117
Geary St., Park & Ocean RR. 1st mtg. 5a.	1,000,000	871,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. g. 5a.	8,000,000	8,000,000	1918	J. & J.	120%	.....
†Metropolitan Ry. Co.....1st mtg.	200,000	.....	.....	.....	.....	.....
†Omnibus Cable Co.....1st mtg. 5a.	2,000,000	2,000,000	1918	A. & O.	120%	.....
†Park & Cliff House RR.....1st mtg. 5a.	850,000	850,000	1912	J. & J.	105%	107
†Park & Ocean RR.....1st mtg. 5a.	250,000	250,000	1914	J. & J.	115	.....
†Powell St. Ry.....1st mtg. 5a.	700,000	700,000	1912	M. & N.	.....	125
†Sutter St. Ry. Co.....1st mtg. g. 5a.	1,000,000	900,000	1918	M. & N.	.....	.....
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Mar 12, 1901						
Belt Ry. Co.....Cons. mtg. 5a.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 5a.	500,000	500,000	1914	A. & O.	123	.....
Eckington & Soldiers' Home 1st mtg. 5a.	300,000	300,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 5a.	500,000	500,000	1901	J. & J.	.....	.....
†\$50,000 in escrow to retire 1st mtg. bds.						
Miscellaneous						
Date of Quotation—Mar 2 1901						
Bridgeport Traction Co.....1st mtg. 5a.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 5a.	5,000,000	8,548,000	1981	F. & A.	118	.....
†"Hens" St. R. (Ind. pols.) 1st cons. m. 5a.	4,000,000	8,000,000	1908	M. & N.	104	104
Oranstown St. Ry. (Buffalo) 1st mtg. 5a.	8,000,000	2,866,000	1922	M. & N.	112	118
†Columbus (O.) St. Ry.....1st cons. g. 5a.	8,000,000	2,261,000	1922	J. & J.	115	.....
Consolidated Traction (N. J.) 1st mtg. 5a.	15,000,000	13,965,000	1928	J. & D.	111%	111%
†Crosby St. Ry. (Colu's, O.) 1st mtg. 5a.	2,000,000	572,000	1928	J. & D.	115	115%
Denver City Cable Ry.....1st mtg. g. 5a.	4,000,000	8,800,000	1920	J. & J.	20	.....
Denver Con. Tram'g Co.....Cons. m. g. 5a.	4,000,000	923,000	1928	A. & O.	80	85
Louisville (Ky.) Ry.....1st cons. mtg. g. 5a.	6,000,000	4,981,000	1910	J. & J.	119	119%
†Minneapolis St. Ry. 1st cons. mtg. g. 5a.	5,000,000	4,050,000	1919	J. & J.	110%	110%
†No. Hudson Co. Ry. (N. J.) Cons. mtg. 5a.	8,000,000	2,878,000	1928	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.) 2d mtg. 5a.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.) Deb. 5a.	500,000	489,000	1902	F. & A.	.....	.....
Paterson (N. Y.) Ry.....Cons. mtg. g. 5a.	1,250,000	1,000,000	1901	J. & D.	.....	.....
†Rochester (N. Y.) Ry.....1st mtg. 5a.	8,000,000	2,000,000	1980	A. & O.	.....	.....
St. Paul City Ry.....Cons. g. 5a.	5,500,000	4,298,000	1907	.....	108%	108
St. Paul City Ry.....Deb. g. 5a.	1,000,000	1,000,000	1909	.....	108	.....
†\$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
†\$500,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
†\$750,000 in escrow to retire bonds of C. St. RR. Co.						
†\$87,000 in treasury.						
†\$500,000 reserved to redeem prior liens.						
†\$520,000 in escrow.						
*With Int'						

*With int'ree

ELECTRIC LIGHT AND ELECTRIC MFG. CO'S

Boston, Mass.						
Date of Quotation—Mar 12 1901						
Delaware Gas Lt. Co.....1st m. 5a. g.	800,000	800,000	.....	J. & J.	108	108
Edison Elec. Illuminating Co., Boston.....	3,026,000	.....	.....	Quar.	157	.....
General Electric Co., gold coup. deb. 5a.	10,000,000	8,750,000	1923	.....	116	.....
Pittsburg Pa.						
Date of Quotation—Mar 12, 1901						
Allegheny County Light Co.....5a.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Scrip 5a.	196,870	.....	.....	M. & N.	.....	.....
Miscellaneous. —(Mar 12 1901.)						
Edison El. Ilig. Co. (N. York) 1st m. 5a.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilig. Co. (N. Y.) con. m. g. 5a.	15,000,000	2,188,000	1908	.....	124	.....
Edison Elec. Ilig. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122%	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5a.	2,500,000	.....	1907	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 5a.	5,178,000	.....	1907	A. & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5a.	8,000,000	.....	.....	F. & A.	102%	.....
United Elec. Light & Power Co. (N. Y.).....	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—Mar 12 1901.						
American Bell Telephone.....4a.	.....	.....	1908	F. & A.	100%	101
Northwestern Telegraph Co.....5a.	.....	.....	.....	.....	114	116
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 5a.	.....	.....	1911	J. & D.	108	106
Chesapeake & Potomac Teleph. Co.....5a.	.....	.....	.....	.....	.....	.....

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—Mar 12 1901						
American Electric Heating.....7a	500,000	500,000	.....	.....	.....	25
Armington & Sims Engine Co.....	.....	.....	.....	.....	.....	107
Barnes & Smith Car Co.....5a.	.....	.....	1942	J. & J.	106	.....
Carborundum Mfg Co.....5a.	.....	.....	1904	J. & D.	.....	.....
Washington Pump Co.....	75,000	.....	.....	.....	115	127
Unlisted						
†Nominal.						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½¢@16¾¢; Lake, 16¼¢@16½¢; casting, 16½¢@16¾¢.

Directors of the Commercial Cable Company have declared a quarterly dividend of 1¼ per cent., payable April 1.

The regular semi-annual dividend of \$2 per share has been declared on Philadelphia Traction stock, payable April 1 to holders of record March 9.

The annual meeting of the Centennial Copper Mining Company, will be held April 2, at 12 m. in Boston. Transfer books close March 11 and open April 3.

The General Electric Company has declared a quarterly dividend of 2 per cent. on its common stock, payable April 15 to stock of record March 30.

The Bronx Gas & Electric Company has given a mortgage to the Continental Trust Company for \$500,000 to secure an issue of 50-year 5 per cent. gold bonds for the same amount.

The Jamestown (N. Y.) Street Railway Company reports for the quarter ended December 31: Gross earnings, \$21,685; net income, \$1,282; cash on hand, \$137; profit and loss surplus, \$20,775.

The Twin City Rapid Transit Company has declared the regular quarterly dividend of 1¼ per cent. on its preferred stock, payable April 1. Books close March 26 and reopen April 2.

A franchise has been granted to the Clyde Electric Railway to construct a direct line through Clyde, N. Y. This is part of a Rochester syndicate's plan for an electric road to connect all villages between Rochester and Syracuse and to light all the towns.

It is reported that the New York, New Haven & Hartford Railroad Company will make an effort to purchase the trolley lines operated by the Old Colony Street Railway Company, and that it is preparing to complete its service of electric cars from Newport to Providence and Boston.

The Metropolitan Elevated Railroad Company of Chicago has issued a circular to stockholders announcing the desire of the management to issue \$1,400,000 additional bonds for the purpose of completing the extensions to the road recently outlined by the president of the company. A special meeting of the stockholders has been called for April 8 to authorize the issue of these bonds.

The negotiations for the purchase of the Suburban Railway Company by the Metropolitan West Side Elevated Railway Company of Chicago are reported as having been consummated. The money to cover the purchase will not be provided for until the special stockholders' meeting on April 8. It is unofficially stated that the price agreed upon was slightly in excess of \$1,000,000.

The Chicago Edison Company's fiscal year ends with this month and the annual meeting is held in June. Officials of the company decline to discuss earnings of the periods. Interests usually well posted on Edison affairs say that the net earnings of the year will approach the \$1,000,000 mark, and after meeting bond interest and dividends on the stock, there will be a sum of some size applicable to surplus account.

The Union Traction Company, which was incorporated at Trenton, N. J., on the 6th inst, with an authorized capital of \$1,000,000, on Saturday increased its capital to \$15,000,000, of which one-half is preferred with 5 per cent. cumulative dividends. The papers were signed by Ashley T. Cole, of New York, president, and L. B. Grant, of Brooklyn, secretary. The purposes for which the company is incorporated are to construct bridges, buildings, machinery, engines, cars and other railway equipments, waterworks, gas works and electric light and power works.

The United Railways & Electric Company of Baltimore has negotiated with the Mercantile Trust & Deposit Company the sale of \$2,800,000 of its first consolidated mortgage 4 per cent. bonds to be issued by the company and paid for by the Mercantile Trust & Deposit Company as needed for the requirements of the railway company. The proceeds of these bonds will be used to retire maturing underlying 5 and 6 per cent. bonds and pay for the cost of the new central power house and other extensions made by the company. This sale will provide the railway company with all funds necessary to complete the proposed extensions and improvements as originally planned and modified. The only listed bonds of the company which mature this year are \$1,250,000 Baltimore Traction extension and improvement 6s. The improvements contemplated in arranging curves and making extensions, however, will require considerable money.

The management of the Illinois Electric Vehicle Transportation Company has issued a circular announcing that it has been decided to liquidate the company. The assets will be disposed of and the proceeds distributed among the stockholders. Of the capital stock of the company, there has been actually issued 158,620 shares, the amount received on subscriptions being \$793,700. There has been paid out on account of real estate \$50,000 and \$31,760 has been invested in improvement of the same. The expenditures on various other accounts up to February 1 aggregated \$642,588. The gross income to February 1 was \$137,106 and the total operating expenses, \$265,885, showing a loss of \$128,778, with additional loss in depreciation of vehicles and station equipments. The company on the date mentioned had \$205,488 in cash on hand or in bank and now owns 109 vehicles. The consent of the Electric Vehicle Company has been obtained to a cancellation of the contract between the two companies and a settlement of all existing claims and an exchange of mutual releases. A meeting of the stockholders of the Illinois Electric Vehicle Transportation Company has been called for April 4 to ratify such cancellation of contracts.

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EDITORIAL NOTES.

Marconi's Object in Visiting This Country.

William Marconi arrived
in this country from Eng-
land last week. His ob-
ject in coming to the
United States—where he

will remain, however, only about three weeks—
is to do for this country what he has already
done for England, namely, equip a number of
stations along the coast with his wireless ap-
paratus, so that the approach of incoming
steamers may be announced long before the
vessels themselves are in sight. Stations of
this nature have already been erected on the
other side at Portsmouth, St. Catherine, Isle
of Wight, Haven Pool, Dorset, Portland and
other points. As is well known, these stations
are of the greatest utility during stormy or
foggy weather, by enabling vessels that are
equipped with Marconi's apparatus to be ap-
prised of their exact location. As yet, however,
but few of the trans-Atlantic liners are pro-
vided with the necessary apparatus for re-
ceiving such information, although his instru-
ments have been installed on many warships.
Twenty-eight British war vessels are so equip-
ped, four Belgian ships, three of the German
Navy, and twenty Italian men-of-war. In this
connection it is Marconi's hope that on this
visit he will be able to reach some understand-
ing with the Navy Department in Washing-
ton looking to the installation of his appar-
atus on ships of the United States Navy. Re-
ferring in a recent interview to the principal
object of his visit, the Italian inventor says:

"I am here to establish signal stations along
the coast so that incoming vessels may be
reported more quickly than they are now.
Some lines are already fitted with my system,
but the North German Lloyd line is the only
one that I can name. With this service com-
munications from vessels 200 miles out to sea
can be received on shore. In England wireless
telegraphy is taken as a matter of course.
It receives no more comment now than the
telephone system. It is in very general use.
About forty English warships are fitted with
the instruments, and good results are obtained.
I hope to induce the United States Navy De-
partment to adopt wireless telegraphy. It is
just as useful in fog and stormy weather as it
is at any other time. I do not think the in-
struments taken to South Africa by the Brit-
ish soldiers yielded many results, for the

reason that the British in the hurry of un-
packing broke or lost them."

Such signaling stations as Marconi proposes
to erect would unquestionably prove of great
advantage to the merchant marine, and it is
therefore to be hoped the matter can be car-
ried in the near future to a successful issue.

* * *

Our English Cousins on the Steel Combination.

Our attention is ar-
rested by an editorial
in the London "*Elec-
trician*," which com-
ments on the late
American combination
of capital and manufacturing interests known
as the "Steel Trust," which has a capital
of \$1,110,000,000. Our esteemed contemporary
is not concerned regarding the probable effect on
American home markets, but is anxious regard-
ing the influence of this "bold combine" on the
British and its Colonial engineering markets,
and fear is expressed that should the "trust"
be sustained it will use the British and other
outside markets "as a convenient dumping
ground for their surplus products, at prices
which will seriously handicap local manufac-
turers." It is also stated that "history shows
that the artificial stability of these enormous
combines is not easily or long maintained."

Without commenting on the effect of Mr. J.
P. Morgan's combination in any way, except its
bearing on the English and other European
markets, we must agree with the "*Electrician*"
that these markets have much to fear for
their former prestige, for these as well as other
combinations are along the direct economic
lines of manufacturing advancement, which
will eventually make the United States su-
preme in international trade, and Europe has
justly much to apprehend from these Ameri-
can combinations, for they will be able to fur-
nish better products, with quicker deliveries,
regardless of the intervening Atlantic and Pa-
cific Oceans, and at a much less price than
foreign manufacturing firms can offer.

European nations have only just commenced
to feel the influence of our manufacturing en-
terprises; this influence is destined to become
more and more pronounced with time and it
will be hopeless for Europe to expect to success-
fully compete except by adopting our methods,
which are the direct outgrowth of restless en-
ergy, superior patent laws, universal free edu-
cation for the masses, untrammelled speech
and action, freedom of the press and political

equality, without a specially favored class rule.

Europe will not give up class precedence, she must therefore suffer the consequences.

Regarding the stability of these combinations we must beg to differ from our esteemed contemporary. Their stability, and consequently our national success, rests on the universal intelligence of the masses who recognize their universal utility. The English workingmen in their trade unions discourage modern improved economical methods, and by so doing they are driving from England her manufacturing supremacy; thus the country must suffer from the lack of foresight and the lack of liberality of its ruling element.

England has not yet thoroughly recognized that the brotherhood of man is the true foundation of national success in this era.

Our Morgans and Carnegies know full well that if their methods are not in conformity with public utility, and that if they are not just in their dealings with the public and their employees, that there is a higher court than the Supreme Court—even though all its judges should be selected by or be in their employ—that would wipe their despotism out of existence.

The United States allows each man free reign to develop his talents for the benefit of the public, and also educates its people to recognize the public utility of these individual talents, consequently all work in harmony for the public good—and it is also well recognized that class or individual selfishness, intolerance or despotism are contrary to public utility.

* * *

Proposed Customs Tariff for the Philippines.

A Commission appointed in Washington to recommend customs tariff for the ports of the Philippine Archipelago has reported. The recommendations relating

to electrical apparatus and machinery are especially interesting, and should be studied by electrical manufacturers interested, as the War Department will be pleased to receive suggestions regarding the proposed tariff up to April 15 next.

It is provided among other things that articles not enumerated in the tariff shall, for the application of duty, be assimilated to those which they most closely resemble, and shall, in the first instance, be so classified by the Collector of the port of entry into which the articles are brought.

When an article presented for customs clearance is not included in the tariff, and when doubts arise as to its assimilation, the interested party or the importer may request the Collector at the port of entry to indicate the number according to which such article is dutiable, and clearance shall be affected in accordance therewith.

When articles are composed of two or more materials, or of different parts, the duty for total weight shall be taxed upon component material of chief value.

Common packing, packages, receptacles and coverings of imported merchandise in use and imported with such merchandise, unless otherwise expressly provided for, shall be admitted free of duty; if any articles so used are in fact imported as merchandise, and have an appreciable value, full duty is to be collected on same; and whenever such articles are of higher value than their contents, they are

always dutiable according to the number of the tariff to which they belong.

Gross weight includes all coverings of whatever nature, without any allowance for tare. Net weight, it is explained, is the weight of the articles exclusive of any and all covering.

When the same package contains two or more articles dutiable on gross weight and paying different rates of duty, the articles most highly taxed shall be dutiable with all their separate packing and with the weight of all exterior packages. The other articles shall be dutiable separately.

The proposed rates of duty on some of the material—of interest to the electrical fraternity—are as follows:

Ampere meters, \$25 per 100 kilos, net weight. Electric batteries, \$3 per 100 kilos, net weight. Storage batteries, \$25 per 100 kilos, net weight. Cables for conducting electricity over public thoroughfares, \$5 per 100 kilos, net weight. Carbon, prepared for electric lighting, \$5 per 100 kilos, gross weight. Copper cables, for conducting electricity, \$5 per 100 kilos, net weight. Copper ingots, \$2 per 100 kilos, net weight. Dynamos, \$5 per 100 kilos, net weight. Electric apparatus and appliances, \$3 per 100 kilos, net weight. Electric arc lamps, \$3 per 100 kilos, net weight. Electric fans, \$3 per 100 kilos, net weight. Electric insulators, of common glass, \$1 per 100 kilos, net weight; of porcelain, \$5 per 100 kilos, net weight. Electric lamps, incandescent, glass or crystal, \$2 per 100. Electric lighting machinery, \$5 per 100 kilos, net weight. Electric power and heat machinery, \$5 per 100 kilos, net weight. Electric stoves, \$3 per 100 kilos, net weight. Galvanometers, \$25 per 100 kilos, net weight. Electric generators, \$5 per 100 kilos, net weight.

Manufacturers having any suggestions to make should forward same to Washington at as early a date as possible, and in any case not later than the date mentioned above.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

At a meeting of the Society of Arts last week in London, Mr. Fritz Behr read an interesting paper on the subject of his mono-rail system, which he is trying to establish between Manchester and Liverpool.

THE next meeting of the New York Electrical Society will be held on Wednesday March 27, when the society will visit the new factory of the New York Electric Vehicle Transportation Company, located at Eighth avenue and Forty-ninth street. It is the intention of the officers of the society to have the working and operation of the vehicles and apparatus explained in detail.

THIS country is to have a National Standardization Bureau, as the late Congress so decreed before final adjournment.

A NOVEL method of predicting the weather has been discovered by Prof. A. Tommasina, a French scientist. He uses for this purpose an instrument, which he has just perfected and which he calls an "electrical radiophone." By means of it he can ascertain the exact nature of the electrical currents in the air at any

moment, since the instrument is fitted with a clockwork arrangement, which registers the precise quality of each current. There are also several bells in the instrument, each of which is bound to ring whenever it is affected by a particular current. If the current is strong, a loud bell rings; if it is weak, only a slight tinkling is heard. Prof. Tommasina claims that this instrument will be found of great service, especially on vessels at sea, since it will prove much more reliable than the present method of ascertaining weather conditions, which is of hardly any use except near a coast. He claims indeed that a vessel, provided with an "electrical radiophone," can ascertain the approach of a storm far away at sea in time to enable the crew to make ample preparations for it. A full account of this ingenious discovery has been sent to the French Academy of Sciences.

A SPECIAL cable dispatch to the N. Y. "Sun," states that the London "Evening News" prints an interview with Mr. C. T. Yerkes in regard to his investments in London underground railways. Mr. Yerkes is quoted as saying: "I have not bought anything except the charter of the Hempstead & Charing Cross Tube Company, and I do not contemplate purchasing anything else. One railway is enough at present. Mr. R. W. Perks, M.P., our solicitor, is also counselor for the underground roads. Perhaps the story that I had purchased the entire underground system of London arose from that fact."

ADVICES from Washington, state that the Post Office Department is experimenting with an electrical registering device for mail boxes introduced to act as a check on carriers. Citizens continually complain that the carriers have not collected the mail regularly from boxes on their routes. By the new device every box is to be connected by wire with the central office, and every time one is opened a signal will be sent to headquarters.

LONDON's first automobile for service in the conveyance of passengers was started last week between Streatham and Clapham Junction. An attempt was made two years ago to run automobile 'buses between Victoria and Kensington. These vehicles were ordinary omnibuses with heavy broad tired iron wheels, but were so noisy and cumbersome that they were as unsuitable for London streets as so many steam rollers and quickly disappeared. The new service deserves to be called automobiles. The carriages are light, smart and comfortable, seating eight passengers inside and one by the side of the driver. This new service affords easy and rapid transit between two populous districts, where there was only a circuitous railway journey, taking twice as long.

Now that the British Government has admitted that it is building submarine boats, the Vickers' Sons and Maxim Company has given out the corrected dimensions of the boats and other particulars. Each will be 63 feet 4 inches long, have 11 feet 9 inches beam, and have a submerged displacement of 120 tons. The main engine, of the gasoline type, will be of 160 horse power. The boats will carry enough fuel to enable them to steam 400 knots. The maximum surface speed will be 9 knots. The main motor will be electric, giving a submerged speed of 7 knots. Means will be provided for expelling torpedoes under a variety

of conditions. The armament will consist of a single torpedo expulsion tube, located in the bow of the vessel. Each boat will be able to carry five torpedoes, each 11 feet 8 inches long.

THE People's Tramway Company of Killingly, Conn., controlled by the New Haven Steam Railway Company, began March 15 operating its great electric plant at Dyer's Dam in Killingly. The dam and works have been 16 months building, and are reported to have cost \$500,000. It is by far the largest electric-power plant in the State, and one of the largest in the country. Besides electric lighting, it will operate before long some thirty miles of trolley lines, including the laterals which are to be used to haul freight to the Norwich and Worcester Division of the New Haven Company.

THE harbor of Newport, R. I., is to be provided with powerful searchlights at each of the new fortifications and garrisons. The work already has taken definite form, and a gang of mechanics about Fort Adams is erecting a power house to contain two generators for the purpose of lighting the batteries, the post, and to supply the searchlights. An appropriation of \$20,000 is available for the work at Fort Adams. The manœuvres of the navy there last summer demonstrated one important fact, if nothing else, and that was the blinding effect of searchlights upon the crews of the ships. The men at the wheel were unable to steer their boats safely, and in these tests they were declared "put out of action" by the searchlights and captured. During the manœuvres next fall in New York Harbor and about the Narrows by the army and navy, tests will be made by the searchlights on the forts and those operated on the ships which will attempt to force an entrance into the harbor. Similar tests will be made in Newport next summer by the North Atlantic Squadron, carrying out some of the problems the War College will have arranged.

W. DUDDELL, an electrician of London, has discovered a method of producing musical sounds from the electric arc, and recently gave a lecture upon these investigations before the London Institution of Electrical Engineers. It is only the solid carbon, that which is homogeneous in its nature, that is capable of producing these unusual sounds. The cored carbons are absolutely silent. Not only is it possible to obtain musical sounds, but they may be varied so as to produce a tune, and to exemplify his thesis the inventor played a popular air. The variations in the sounds are accomplished by a by-pass or shunt placed across the carbons, and which have the same effect as the fingers and keys upon a flute. Mr. Duddell, in the course of his lecture, arranged four arcs in series to increase the intensity of the sound, and by varying the self induction and capacity in the shunt circuit by means of a keyboard, of two octaves, produced his tune. The keyboard may be placed at any distance from the lamps without depreciating the musical effects emitted by the arcs. The inventor has also requisitioned the electric-light arc for receiving telephonic messages transmitted from another point of the building.

With the return to Buffalo, N. Y., of Director General Buchanan from Washington,

the plans for opening the Pan-American Exposition are assuming definite shape. It has been decided that the Exposition shall be opened on May 1. At that time President McKinley and his Cabinet are expected to be on their way to the Pacific Coast. It is proposed to connect the President's train by telegraph with the Temple of Music. Direct telegraphic communication will also be established with the executive offices of the Presidents of all the republics of the Western Hemisphere and the Governor General of Canada. At precisely 2 o'clock, Buffalo time, they will all be requested to touch electric buttons, which will start a piece of machinery of the Exposition. At the same time it is expected they will transmit a message of greeting. President McKinley, from his special car, surrounded by his Cabinet, will then start the great fountain pumps, and will transmit over the wires a message of greeting to the people assembled on the occasion of the opening. The details connected with this novel and remarkable arrangement are being worked out.

The several London electric lighting companies had anything but a cheerful twelve months in 1900. They all added many new customers and did a greatly increased business, but the high cost of coal has troubled them all badly. The fuel bill has in some cases been higher by \$40,000 to \$50,000 for the year. Most of the companies have been spending large sums upon new plants. The Metropolitan Electric Supply Company, whose new station at Willesden was recently described in these columns, is operating its three large Westinghouse generators, and is now putting down two new ones of the same type and size, bringing the capacity of the station up to 12,500 hp. The year has been largely taken up changing over from alternating to continuous current supply to consumers. The outlay has been great but the economy will be greater. The Brompton and Kensington Electricity Supply Company has also been spending a good deal of money scrapping its old horizontal sets and substituting the most modern vertical sets. The old plant took up four or five times as much room as that of the same power which has been installed in its place. The Charing Cross Company, which is now supplying energy within the area of the City Company, has its mains laid in 55 city streets, so that the competition may be expected to grow somewhat keen between the rival concerns.

In an illustrated article contributed to the "Elektrotechnische Zeitschrift," Mr. F. R. Dietze describes in detail the construction of a type of starting switch which since its introduction by a German firm some two years ago has been largely adopted with satisfactory results. A mixture of graphite and carbon is used in this switch as a resistance, whereby exceedingly fine graduation is obtained, in virtue of which the apparatus is claimed to be especially suitable for elevator and crane installations, where the motors must necessarily be started up on load and frequently switched in and out of circuit. It is well known, says the London "Electrical Engineer," that the gradual and uniform withdrawal of resistance from the motor circuit obtained with a very finely graduated controller tends to minimize the sparking and wear at the commutator. The ingenious manner of employing graphite in the form of a

powder as a variable resistance is fully described. It may be mentioned that the switch contact passes through the powdered graphite. The variation, it is claimed, is effected as gradually and uniformly as with a liquid resistance; while the material is not liable, as in the case of a liquid, to either evaporation or decomposition. By adding a larger or smaller proportion of carbon with the graphite, the same apparatus may be adapted to any working pressure between 65 and 600 volts. The author suggests, in conclusion, that in virtue of its incombustibility and other desirable qualities as a variable resistance, graphite admixed with carbon may find further useful applications for switch gears.

ACCORDING to Dr. Eydam, a German physician, there are no more reliable weather prophets than telegraph wires. This novel discovery was made by him in the following manner: As he was waiting for a train at a country station he heard a shrill sound, which was made by the wind as it passed through a network of nearby wires. At once the doctor remembered that he had frequently heard a similar sound either immediately before or after a storm or a heavy fall of rain or snow, and it naturally occurred to him to try and ascertain whether there was any connection between the sound and such changes in the weather. As a heavy shower of rain fell within forty-eight hours after he had heard the sound at the railroad station, he concluded that there was such a connection, and he then determined to investigate the matter thoroughly. As a result he now maintains, first, that any unusual disturbance in the telegraph wires is an infallible indicator of bad weather, and, second, that the nature of the changes in the atmosphere may be learned from the sound which the wind makes when passing through the wires. Thus a deep sound, he says, which is of considerable or medium strength, indicates that there will be slight showers of rain with moderate winds within from thirty to forty-eight hours, and, on the other hand, a sharp, shrill sound is the sure token of a heavy storm, which will be accompanied by much rain or snow.

A GREAT telegraph case is before the Court of Appeals, in Toronto, Ont., and is occupying the attention of nearly all the prominent legal firms of the city. The plaintiff is George Morrow, a Boston broker, and he is suing to set aside a transfer of stock in the Montreal Telegraph Company to the Great Northwestern Telegraph Company, whereby the Western Union Telegraph Company secured control of both companies. He failed before the lower court. It is said that \$20,000,000 of securities are directly and vitally involved in the result of the action and appeal. It is claimed, incidentally, by the plaintiff that the Great Northwestern Company is not earning the 8 per cent. dividend it pays annually to the Montreal Telegraph shareholders, and that the Western Union is making up the deficit and charging it against the Canadian companies.

THE United States Coast and Geodetic Survey has organized a special bureau charged with a magnetic survey of the whole country, including Alaska, the Hawaiian Islands and Porto Rico. Some five hundred stations have already been occupied and the magnetic elements—declination, dip and intensity—have been determined.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 19.

RULES, TABLES AND FORMULÆ.

A workman should thoroughly familiarize himself with the rules and requirements of the National Board of Fire Underwriters before attempting to do any electrical construction.

If a good workman, who has a proper knowledge and understanding of the construction work he intends to do, will follow the dictates of his best judgment there will be no question of the work not complying with the underwriters' requirements. The rules are all based on good engineering practice and are a necessity for the prevention of unreliable and dangerous work.

The following are a few of the more important suggestions given in the code and are applicable to all electric light, heat or power construction.

In all electric work conductors, however well insulated, should be treated as bare, to the end that under no conditions, existing or likely to exist, can a grounding or short circuit occur, and so that all leakage from conductor to conductor, or between conductor and ground, may be reduced to the minimum.

In all wiring special attention must be paid to the mechanical execution of the work. Careful and neat running, connecting, soldering, taping of conductors and securing and attaching of fittings, are specially conducive to security and efficiency, and will be strongly insisted upon.

Wires must not be of smaller size than No. 14 B & S., except when used for wiring fixtures or by special permission. Wires must be separated from contact with walls, floors, timbers or partitions through which they may pass by non-combustible, non-absorptive insulating tubes, such as glass or porcelain. Bushings must be long enough to bush the entire length of the hole in one continuous piece.

Transformers must not be placed inside of any building, excepting central stations, unless by special permission of the inspection department having jurisdiction. They must not be attached to the outside walls of buildings, unless separated therefrom by substantial supports.

Switches must be placed on all service wires, either overhead or underground, in a readily accessible place, as nearly as possible to the point where the wires enter the building, and arranged to cut off the entire current. Knife switches must be so placed that gravity will tend to open rather than close the switch. They must not be single-pole, except where the circuits which they control supply not more than six 16 cp. lamps or their equivalent.

Automatic fuse cut-outs must be placed on all service wires, either overhead or underground, as nearly as possible to the point where they enter the building and inside the walls, and arranged to cut off the entire current from the building. They must be placed at every

point, throughout a system, where a change is made in the size of wire (unless the cut-out in the larger wire will protect the smaller). All cut-outs must be in plain sight, or inclosed in an approved box, and readily accessible. They must not be placed in the canopies or shells of fixtures.

Circuits or groups of incandescent lamps requiring more than 660 watts must not be dependent on one cut-out. Special permission may be secured for departure from this rule in case of large chandeliers, stage borders and illuminated signs.

No fuse must have a rated capacity exceeding the allowable carrying capacity of the wire it protects.

In open work wiring, supports must be placed at no greater distance than 4½ feet apart.

When wires are run in wooden moulding the moulding must have at least two coats of waterproof paint.

Flexible cord must not be used except for pendants, wiring of fixtures and portable lamps or motors. It must not be used as a support for clusters.

The following is a table showing the safe carrying capacity of conductors of different sizes in B. & S. gauge as given in the rules.

B. & S. G.	Rubber-covered wires.		Weatherproof wires.		Circular Mils.
	Amperes.		Amperes.		
18.....	3.....	5.....	1,624		
16.....	6.....	8.....	2,583		
14.....	12.....	16.....	4,107		
12.....	17.....	23.....	6,530		
10.....	24.....	32.....	10,380		
8.....	33.....	46.....	16,510		
6.....	46.....	65.....	26,250		
5.....	54.....	77.....	33,100		
4.....	65.....	92.....	41,740		
3.....	76.....	110.....	52,630		
2.....	90.....	131.....	66,370		
1.....	107.....	156.....	83,690		
0.....	127.....	185.....	105,500		
00.....	150.....	220.....	133,100		
000.....	177.....	262.....	167,800		
0000.....	210.....	312.....	211,600		

SOME CONVENIENT FORMULÆ.

To measure resistance by the use of a voltmeter, connect the voltmeter across the terminals of any constant current, noting the reading; then connect the unknown resistance in series with the voltmeter across the terminals, which will then give a lower reading than the first. Now the following formula may be used. Divide the first reading by the second reading, then multiply by the resistance of the voltmeter, then from the result subtract the resistance of the voltmeter and the result obtained will be the ohms resistance of what is being measured. For example, suppose the first reading be 20 volts and the second after the resistance has been placed in series be only 10 volts, and the resistance of the voltmeter

$$20 \div 10 = 2 \times 1,000 = 2,000 \text{ ohms.}$$

which would be the resistance of that which is being measured.

To measure the amount of current flowing in a circuit by the use of a voltmeter, place a known resistance in the circuit and measure the difference of potential between its ends. The volts so indicated, divided by the known resistance, will give the number of amperes flowing. For example, suppose a known resistance of 5 ohms be placed in a circuit and the difference of potential between its two terminals is 20 volts, then the amount of current flowing in the circuit would be $20 \div 5 = 4$ amperes.

To measure resistance by an ammeter, place

the ammeter in series with the circuit to which is applied a known voltage, then divide the voltage by the number of amperes indicated, which will give the resistance. For example, suppose there be a voltage of 100 and a current flow of 2 amperes then the resistance must be $100 \div 2 = 50$ ohms.

To measure voltage by an ammeter, place a known resistance in series with the ammeter across the circuit then the current so indicated multiplied by the known resistance will give the voltage of the circuit. For example, suppose a resistance of 10 ohms be placed in series with an ammeter across a circuit and the current indicated be 3 amperes, then the voltage must be $10 \times 3 = 30$ volts.

By the use of properly calibrated instruments constructed with a sufficiently fine scale these rules will apply accurately enough for all practical purposes.

The following table will be found very useful to anyone designing switchboards.

Bus-bars are generally selected by the current which they have to carry.

Two copper bars bolted together will carry about 180 amperes per square inch of contact section. Copper will carry approximately 1,200 amperes per square inch of cross section.

DIMENSIONS, ETC., FOR COPPER BUS-BARS.

Size in inches.	Amperes Capacity.	Circular mils.	Square mils.	Ohms per foot.
1 x ½	433	318,310	250,000	.0000336 .97
1½ x ½	530	397,290	312,000	.0000269 1.21
1½ x ¾	626	477,465	375,000	.0000223 1.45
1½ x 1	725	556,400	437,000	.0000192 1.70
1½ x 1½	798	716,200	562,500	.0000149 2.18
1½ x 2	916	835,600	656,250	.0000128 2.54
2 x ½	1035	954,930	750,000	.0000112 2.92
2½ x ½	1500	1,591,550	1,250,000	.00000672 4.96
2½ x 1	1715	1,889,440	1,562,500	.00000537 6.07
2 x 1	1222	1,273,240	1,000,000	.00000840 3.89

Article No. 20 will be entitled "The Telephone and Telephone Practice."

Automobile Carriages in War.

Concerning the use of automobile carriages in war, the "Italia Militaire e Marina" observes that the report is most interesting which was recently presented to the French Minister for War by the officers to whom had been entrusted the duty of reporting upon the automobiles which had been employed during the grand army manœuvres. To begin with, they expressed themselves fully convinced of the utility of the new means of transport, of which the advantages may be summed up as follows: The automobile can, at a high rate of speed, convey officers of high rank, whose physical condition does not allow them to remain very long on horseback, from point to point wherever they may desire to personally give orders and superintend the conduct of operations. By means of the automobile general officers would thus be enabled to personally supervise a long line of troops. Equally useful are the services which the automobile can render in the rapid transmission of orders, plans, and things from one corps to another, especially with the petroleum tricycles of the general staff. The motors of the automobiles can also render no unimportant service as regards the dynamos of projectors used at night in the encampments, the automobile thus becoming a rapidly transportable lighthouse.

POLYPHASE POWER PLANTS IN RUSSIA.

BY FRANK C. PERKINS.

The introduction of polyphase alternating current apparatus in Russia has been very extensive during the past few years, as it has in all other parts of Europe, and one of the leading electrical manufacturing firms that has aided in the extensive introduction of this class of apparatus is the well-known Swiss and German firm of Brown, Boveri & Cie, of Baden. One of the largest installations in Russia is the great central station installed by this firm at St. Petersburg for the Société Russe pour l'Exploitation de la Force Electrique of that city. The accompanying illustration shows the engine and generator room of this station with the measuring instruments, generator and distribution switchboard in the background.

The central station at St. Petersburg has a

ing three-phase alternating current machines with great success for some time and is using a number of polyphase motors for driving conveyors, elevators, cranes and various other machinery. This generator room is supplied with 1,000 hp., consisting of four generators of 250 hp. each of the Brown, Boveri design. In Moscow, Russia, a large amount of three-phase apparatus is in use. At the Balischinskaya Works alone nearly 2,000 hp. is required. In this station direct connected engines operate two polyphase generators of 1,600 hp. and 200 hp. respectively, and the motors vary in capacity from 140 hp. and 70 hp. down to 5 hp.

The waterworks plant at Moscow is operated entirely by three-phase motors of the vertical type, directly connected to the pumps. There are twenty of these motors which are of special design for this particular purpose, each of which has a capacity of 20 hp. The waterworks generating plant is designed for a total

idea of the varied uses to which this class of apparatus is put in Russia, and then only a tithe of what one important firm has installed. Other firms have also made many important installations in Russia and the future should give American manufacturers an opportunity to introduce many American machines.

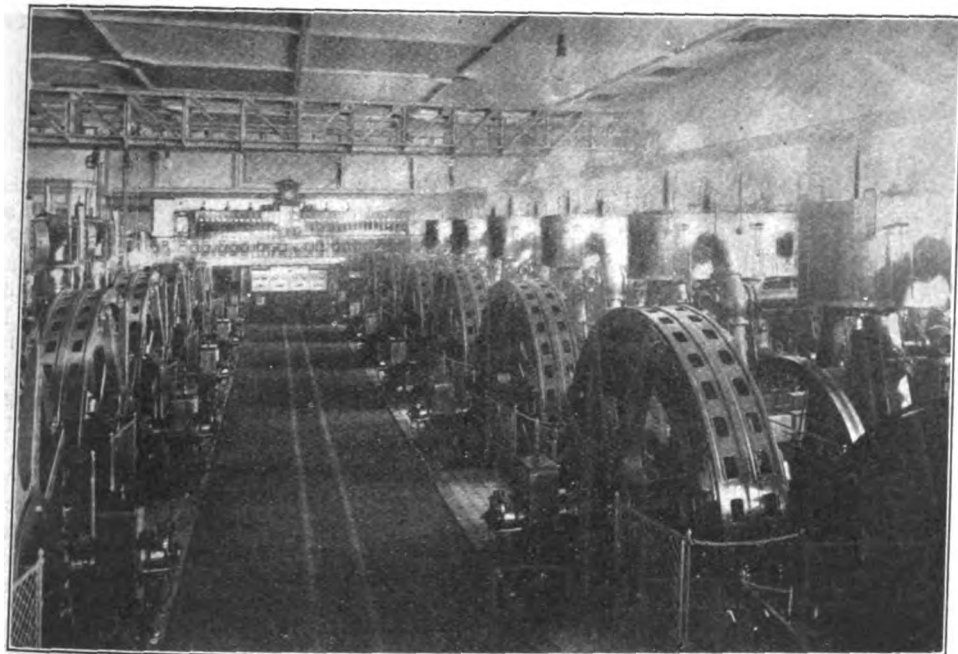
M. GUARINI'S WIRELESS TELEGRAPH EXPERIMENTS IN BELGIUM.*

M. Guarini is still carrying out miscellaneous experiments between Brussels and Malines (13½ miles), and Malines and Antwerp (14 miles). On February 8 he made some tests between the Colonne du Congrès, at Brussels, and the Cathedral of St. Rombaut, Malines, as before, but on this occasion he took the latter point as a transmitting station. He used the same apparatus as before, but his air-wires were different. Since his last experiment storms have broken these, and he now profited by this circumstance to make experiments with a different type of air-wire.

At the transmitting station (Malines) he used the ordinary air-wire with a single cable, but at the receiving point the cylinder of 50 metallic wires of 4 mm. diameter which formerly constituted the upper part of the air-wire was replaced by a cone whose apex was turned towards the ground and connected to earth by a single cable. The cone was formed by 50 wires of 0.4 mm. diameter. The single cable leading from the ground to the apex of the cone extended right through the cone axially to the top of the air-wire. This arrangement is sketched in Fig. 1. At first communication was bad. M. Guarini only receiving at Brussels a very small part of the signals transmitted from Malines, while communicating in the inverse direction he received at Malines all the signals transmitted at Brussels. An analogous effect, he says, had already been observed last year in Paris when telegraphing without wires between the Eiffel Tower and the Pantheon, when it was found that the tower acted very well as a transmitter but gave no results as a receiver. He attributes this to the presence of metallic masses on the monument—the bronze statue of Leopold I at the top, the metal balustrade round the platform, the bannister of the staircase in the interior of the column, the statues at the base, etc. Only on doubling the source of electrical energy at Malines and employing an extra sensitive Blondel coherer at Brussels could he obtain irreproachable transmission. He also found that, other things being equal, the maximum effect was obtained if the air-wires were so placed that the vertical plane connecting them or its prolongation did not meet the column and spire to which the wires were attached (see Fig. 4.) Other experiments show that the sensitiveness of a coherer for a particular wave increases on diminishing the local current in its circuit by using appropriate resistances.

Finally he made experiments to determine the importance of the earth connection. As might be expected, if neither of the stations were connected to earth, or if the receiving station only was connected to earth, no good signals could be transmitted, but with the ordinary earth connection at the transmitting station he found the results better when the receiving wire was not connected to earth than

*From the "Electrician," London.



ENGINE AND GENERATOR ROOM AT ST. PETERSBURG, RUSSIA.

total capacity of 7,540 hp. and is equipped with vertical compound engines, of 200, 300, 340 and 500 horse power capacity. There are thirteen of these units, each directly connected to a three-phase alternating current generator of corresponding capacity of the Brown, Boveri type. The exciters are continuous current machines of the bipolar type, each of which is directly connected to the end of the alternating current generator and engine shaft nearest the center aisle of the station. The power house of the Kew Tramways is also equipped with polyphase apparatus. This plant has a total of 1,800 hp., which consists of one three-phase alternator of 900 hp. and one 900 hp. continuous current traction generator, both of which are directly coupled to compound condensing engines.

The Tanbov Station of the Riazan-Ural Railway has been equipped with polyphase apparatus of a capacity of 720 hp. In this power house two horizontal compound steam engines are used, each delivering 360 hp., directly coupled to two three-phase flywheel generators. The current from this plant is used as well for operating polyphase motors, driving machine lathes, planers, etc.

The power station for the Port of Noworosisk of the Wladikawkas Railway has been operat-

capacity of 900 hp. and has one three-phase generator of 250 hp. for rope driving and two polyphase alternators of 325 hp., each directly connected to a steam engine.

In addition to the several lines of work just mentioned to which this class of alternating current apparatus has been applied, there are many other important plants, including the St. Petersburg tube rolling mills and the many spinning and weaving mills throughout Russia. Among the more important installations for the latter industry is that of Prochoroff at Moscow. This power station has a capacity of 2,600 hp., consisting of two three-phase generators of 1,000 hp. each and one generator of 1,600 hp. These are all directly connected to horizontal compound condensing steam engines and supply current for a large number of polyphase motors for single and group driving of self-actors, ring-spinning frames, card machines, etc. The St. Petersburg tube rolling mills plant above referred to has a station of 540 hp. capacity and is equipped with three three-phase generators and two continuous current machines each of 108 hp. for belt driving. These machines furnish direct and alternating current for lighting and operating motors for driving the rolling mills and machine tools. The above will give the reader a slight

when it was. M. Guarini thinks the explanation of this is that earthing one of the balls of the oscillator increases the potential of the ball connected to the air-wire, and determines the position of a point of maximum vibration at the summit of the transmitting

2 to 2½ amperes at the transmitting station, good results were obtained.

On removing the earth connection from the receiver, however, the results were not so good as those between Brussels and Malines. M. Guarini attributes this to the absence of the

In experiments in the inverse direction, from Antwerp to Malines, communication was, in general, less good. M. Guarini attributes this to two causes. First, a violent wind which deflected the transmitting air-wire at Antwerp to such an extent that parallelism between the two wires was quite destroyed, and, secondly, the enormous metallic masses about the Antwerp Cathedral. With regard to the first cause, in the Malines-Antwerp experiments, the relative positions of the air-wire were as in Fig. 7, that is to say, the receiving air-wire at Antwerp was entirely included between the two planes normal to the wire at Malines, and passing through its extremities; whilst from Antwerp to Malines the planes normal to the Antwerp wire only cut part of the Malines wire (Fig 8). Signals could also be received with the transmitter connection of Fig. 5. In this case it was an advantage to add a capacity at the top of the air-wire.

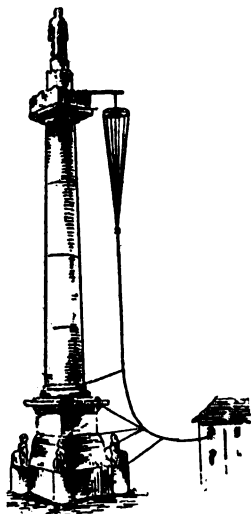


FIG. 1.—BRUSSELS.

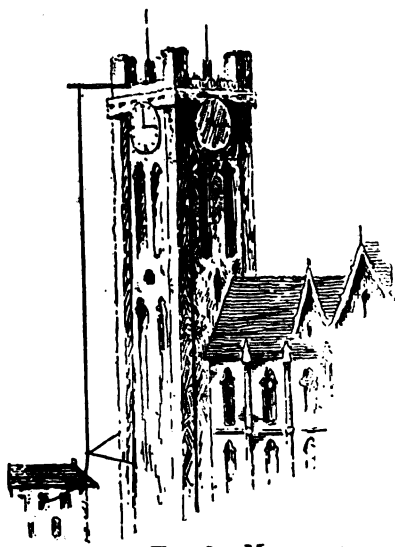


FIG. 2.—MALINES.

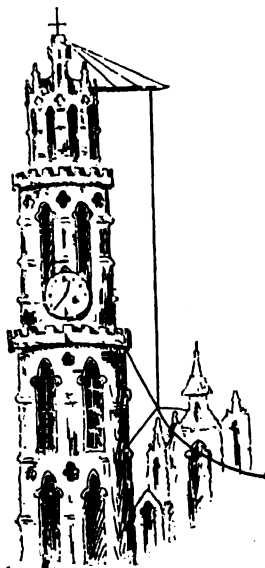


FIG. 3.—ANTWERP.

wire, i.e., at the part most in sight of the receiving wire, while, on the other hand, by insulating the coherer one forms a maximum vibration at the point of the receiving air-wire where the coherer is inserted. He concludes that the earth acts as a large capacity and not as a conductor, this large capacity being advantageous to the transmitter, but harmful in the case of a receiver.

On February 12, M. Guarini experimented between Malines and Antwerp. The transmitting station at Malines was at the Cathedral of St. Rombaut, as before, and at Antwerp the tower of the Church of Notre Dame was employed. The same apparatus was used as in the previous experiments. Simple air-wires were adopted, without capacity at their upper ends. Figs. 2 and 3 show the air-wires at Malines and Antwerp respectively. In the latter case certain difficulties were encountered, owing to the more or less pyramidal shape of the tower of Notre Dame. M. Guarini made up a sort of fishing rod, composed of three pieces of bamboo cane, jointed with metal rings, and fastened this securely on the third gallery. At the extremity of this rod a ring of 7 wires of 0.9 mm. diameter was fixed, and descended in as nearly a vertical direction

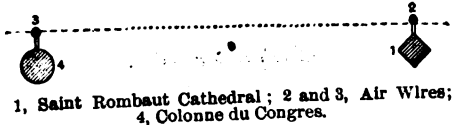


FIG. 4.

as possible to the height of the roof, i.e., about 40 meters from the ground (the third gallery is 106 meters above the ground, or 112 meters above sea level). From this point the wire was slanting to the receiving apparatus, which was placed in a neighboring house. The coherer was of the Blondel pattern, and the earth-wire was formed by three metallic wires connected to a street lamp post.

Between the two air-wires were the groups of houses in Malines and Antwerp, some villages and castles, and undulations from 5 meters to 30 meters in height. With current from

capacity in the upper part of the receiving air-wire in the present case.

Another interesting observation is worth recording. The oscillator at Malines was removed and the air-wire connected to one terminal of the secondary of the induction coil, the

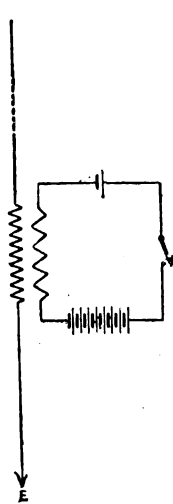


FIG. 5.

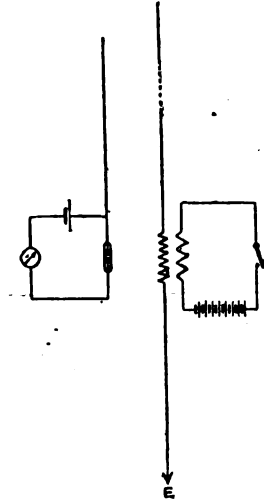


FIG. 6.

other terminal of the secondary being earthed. With these connections (Fig. 5) 12 signals were transmitted, three of which were clearly received at Antwerp. This, M. Guarini points out, constitutes wireless telegraphy in accordance with Edison's American patent 465,971 of 1891, with the difference that the receiving apparatus included a coherer. On removing the

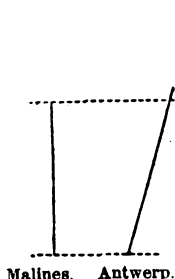


FIG. 7.

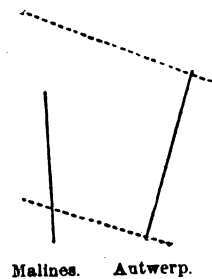


FIG. 8.

earth connection from the coherer (Fig. 6) in this case also signals were still received.

ELECTRO-METALLURGY IN EUROPE IN 1900.

BY JOHN B. C. KERSHAW,
London.

ALUMINUM.

The number of factories producing this metal in Europe has now been increased to six by the completion of the new factory of the Société Anonyme pour l'Industrie de l'Aluminium at Lend Gasteln in Austria. The 5,000 hp. developed at this place is derived from the River Achen which here makes a fall of over 200 feet. About 46,000 hp. is available for aluminum production in Europe, the six factories being situated as follows: Foyers, Neuhausen, St. Michel, Le Pranz, Rheinfelden and Lend Gasteln. The power named above is equivalent to an output of 16,000 tons per year, but all the six factories utilize a portion of their power in manufacture of other products, and the output of aluminum in Europe in 1900 is believed by the writer to have been about 2,500 tons. However, as official information is refused, no very reliable estimate is possible.

The Herault process is employed at five of these factories and a modification of the Hall process is believed to be in operation at St. Michel. The Peniakoff process, which depended upon the substitution of aluminum sulphide for the oxide in the decomposing pots, has not proved economically successful, and only alumina and its salts are manufactured at the Peniakoff factories in France and Belgium.

The utilization of aluminum in Europe is only slowly extending, and this slow growth of the demand for the new metal is the chief reason for the comparative stagnation of production. The trials of the new metal for electrical purposes, have not been so successful in Europe as across the Atlantic. This outlet for the metal has therefore only absorbed a few tons, as compared with hundreds of tons in the United States. In a paper recently read before the London Institution of Electrical Engineers (see *ELECTRICITY*, January 30, 1901) the writer has given the results of independent investigations relative to the durability of aluminum under atmospheric exposure, and has explained the cautious attitude of English engineers towards this use of the metal.

Alloys of aluminum are now attracting more attention in Europe, and in France companies have been formed to manufacture special alloys for which a considerable sale is expected.

Partinium, albradium, and magnalium, are the best known of these.

Heraeus of Hanau in Germany has recently perfected a process of jointing aluminum, which it is hoped will facilitate the adoption of the metal for stills and similar vessels in chemical works. The new method depends upon the welding of the two edges or surfaces, at a temperature below 700°C ., it having been found that at a certain temperature the metal becomes plastic and can be kneaded. Joints made in this way have stood severe tests without failure.

The Goldschmidt process for reducing refractory oxides and for producing high temperatures by use of aluminum powder is now industrially operated in Germany and France, and this minor industry is likely to lead to an increasing demand for aluminum of third or fourth grade quality. In France a low grade metal containing only 90 per cent. aluminum

sumption of copper for electrical purposes, places it at 300,000 tons, or 64 per cent. of the total supply of the metal.

The output of electrolytic copper in 1900 is estimated to have been 210,000 tons, to which total America contributed 172,000 tons and Europe 38,000 tons. The European refineries are all hampered by difficulty in obtaining raw copper suitable for refining by the electrolytic method, and it is this fact which accounts for the comparatively small output of the 31 refineries on this side of the Atlantic.

Nothing has been published during 1900 concerning the Doumoulin and Cowper-Coles processes for depositing tubes and other hollow articles by electrolysis, and it would seem doubtful whether any of these processes when operated on an industrial scale are as commercially successful as the inventors hoped. The Hoepfner process for extracting copper and nickel

electric currents are now in operation in Europe and America. At Sault Sainte Marie, in Canada, ferro-nickel alloys containing 7 per cent nickel have been produced from the ores of the Sudbury district by direct smelting in the Clergue electric arc furnace. Krupp of Essen is said to be interested in the further industrial development of this process. At Hamilton, Ont., the Frasch electrolytic extraction process is receiving trial. In this process, the crushed ore is used as anode material in an electrolyte of sodium chloride. Solutions of sodium hydrate and of the chlorides of the metals present in the ore are obtained, and the latter solution is then electrolyzed with carbon anodes to separate the copper and other metals.

At Papenburg in Germany the Hoepfner process is being operated upon an industrial scale. The copper-nickel ores are roasted, crushed and leached with a solution containing copper and calcium chlorides. The resultant solution is then electrolyzed with carbon anodes and copper cathodes to remove the copper. When the nickel present in solution has risen to 10 per cent., the copper, iron and lead remaining are removed by chemical means, and the solution containing now only nickel chloride is electrolyzed with nickel cathodes in order to separate the nickel.

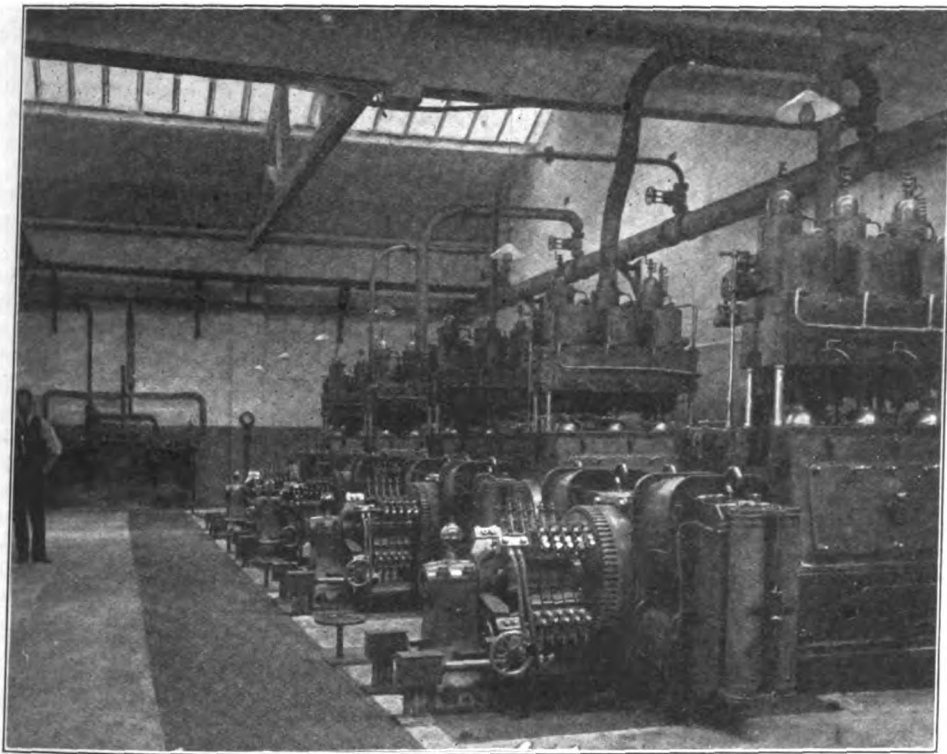
Nickel is refined electrolytically by T. Bolton & Sons in England, by G. Menne & Co. in Germany, and by Nikolajev in Russia. The method adopted is similar to that used in copper refining. The deposition of thick plates without foliation can be obtained by raising the temperature of the solution to 60°C ., or by using the process referred to in the January, 1901, issue of the "Elektrochemische Zeitschrift." The Mond extraction process, for the operation of which a large works is now being erected at Clydach in South Wales, is not an electrical process. The nickel is extracted from the ore as a gaseous product (nickel carbonyl) by passing carbon monoxide gas over the heated ore, after reduction of the nickel to the metallic state.

SILVER AND GOLD.

There is nothing new to report concerning the progress in the bullion refining industry, beyond the fact that a new factory is being erected by the Frankfort Gold-u. Silber-Scheide Anstalt in Sweden, presumably for the operation of the Rössler bullion refining process. Only three electrolytic refineries for the treatment of silver and gold alloys are known to the writer in Europe, namely, at Hamburg, Frankfort and Pforzheim, in Germany. The first uses the Wohlwill process, the second the Rössler process, and the last the Dietzel process. In the United States there are four refineries, at three of which the Moebius process is in use.

Though the industry of bullion refining is thus a very limited one, it is believed to be one of the most profitable of the electro-metallurgical industries, and it is difficult to explain why it should be confined to two countries.

As regards gold extraction from its ores, the progress of the Siemens & Halske process for obtaining the gold from cyanide solutions by electrolysis had been somewhat checked in the gold mining districts of South Africa before the outbreak of the war, by the adoption of improved methods for operating the older zinc process, and the war has of course entirely stopped all work at the mines in the rand.



GENERATING PLANT AT THE ELECTRICAL COPPER COMPANY'S WORKS, WIDNES, ENG.

is now being manufactured specially for use in this industry, and is sold at 17.4 cents per pound.

COPPER.

The year 1900 has not been characterized by any startling developments in the electrolytic copper industry. The price of copper in Europe has varied between \$346 and \$370 per ton for G. M. B.'s during the year, and an increasing demand for the metal for electrical purposes has assisted the Amalgamated Copper Company of New Jersey in keeping its control of the market. The new mining companies floated in London in 1899 and 1900 have not materially improved the situation, and the copper shipped to English and French ports from outside sources during the year 1900 has, according to Messrs. H. R. Merton & Co., only totalled 45,919 tons as against 46,868 tons in 1899. The very great activity now displayed in the United Kingdom as regards electric tramway and railway development is also playing into the hands of the copper financiers, and it seems improbable that any marked fall in the price of copper will occur during the present year. A recent estimate of the world's con-

sumption of copper for electrical purposes, places it at 300,000 tons, or 64 per cent. of the total supply of the metal. The output of electrolytic copper in 1900 is estimated to have been 210,000 tons, to which total America contributed 172,000 tons and Europe 38,000 tons. The European refineries are all hampered by difficulty in obtaining raw copper suitable for refining by the electrolytic method, and it is this fact which accounts for the comparatively small output of the 31 refineries on this side of the Atlantic. Nothing has been published during 1900 concerning the Doumoulin and Cowper-Coles processes for depositing tubes and other hollow articles by electrolysis, and it would seem doubtful whether any of these processes when operated on an industrial scale are as commercially successful as the inventors hoped. The Hoepfner process for extracting copper and nickel

NICKEL.

The year 1900 has been marked by considerable activity in connection with processes for the extraction of nickel from its ores. Nickel steel is now being used largely for armor plates, and the important changes which the addition of nickel brings about in the physical characteristics of iron and steel are also being made use of in the manufacture of alloys for various purposes. The world's output of nickel in 1899 was estimated to amount to 7,350 tons, and that for 1900 will no doubt exceed this total. The greater portion of this amount is still extracted and refined by the older metallurgical processes, but methods involving the use of

In Australia, however, the Siemens & Halske electrolytic process is receiving trial.

None of the methods for using electrolysis to assist the action of cyanide or other solutions, upon the gold bearing quartz or tailings, can yet be considered a practical success, although numerous patents have been taken out. The Pelitan-Clerici process is receiving trial in British Columbia, while the Riecken process is receiving trial in West Australia. Both processes depend upon the use of a solution of potassium cyanide and sodium chloride as electrolyte, with mercury as cathode. The writer has not seen any definite statements concerning the results of these trials.

ZINC.

The various processes for the extraction of zinc from its ores by aid of electrolysis have

improved process consists in the mixture of the pulverized ore with fused zinc chloride; the conversion of the metals into chlorides by pumping chlorine gas through the fused mass; and electrolysis of the fused metallic chlorides in a separate vessel after decantation from the insoluble residue. A small syndicate (the "Phoenix Process Syndicate," capital \$48,000) is carrying out these trials at Milton, and if success attends them, the future prosperity of the process would seem to be assured.

Two other processes for extracting the metallic constituents from mixed sulphide ores have recently been worked out in England, namely, the Fry and the Ellerhausen processes; but these as regards their primary reactions are ordinary metallurgical processes, and therefore not within the domain of this review. In each

seven hours to transmit the first signal through to the terminus station. By using the retransmitter Signor Guarini says that the first signal will be repeated automatically from one station to another and get through the whole distance in a few seconds, and the whole message in little more than the time required for transmitting to the first station.

The experimental Brussels-Paris line will cost about \$20,000. The retransmitter has been installed at Malines, and is working satisfactorily.

ALUMINUM MAINS IN PRACTICE.*

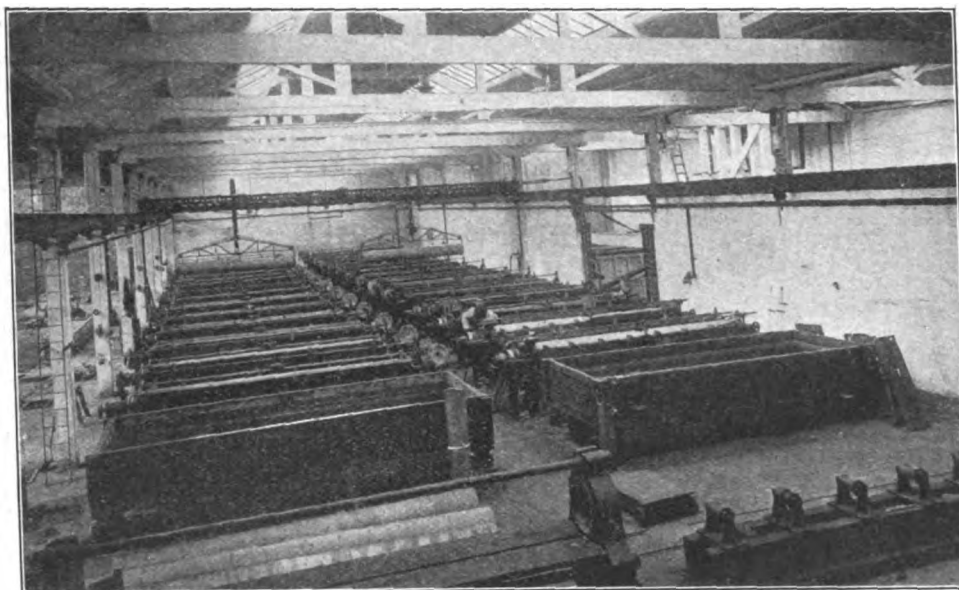
It may prove interesting to state observations taken on an installation of aluminum wires, as mains of an overhead system of distribution, used in the small town of Northallerton, in Yorkshire. This station, owned by the Northallerton Electric Light and Power Company, Limited, was inaugurated in the autumn of 1899, and to keep the first cost as low as possible, aluminum was adopted for the main distributors. From the generating station two aluminum wires, .75 inch in diameter, were erected overhead on both sides of the main street, which is very wide, the private consumers being directly coupled to these two mains, negative and positive respectively.

The public lighting of arc lamps was taken off the negative aluminum, and a positive switch wire of copper was taken back overhead to the station. When the arc lamps were switched out at a certain hour, incandescent lamps fixed on the same poles were switched on by another switch wire, one pole of the incandescent lamps being connected to the negative aluminum, and the other pole to a positive switch wire of copper, which was taken overhead to the station. These wires being stretched side by side, it was convenient to observe their relative actions under practical working conditions.

The steel posts for the suspension of these wires were placed at the maximum distance apart, namely, 200 feet. The aluminum spanned this distance very neatly, and in this respect was better than copper, but its appearance was very ugly, owing to its increased diameter. This span of 200 feet seems quite safe, and no accident of wires falling has taken place. These wires have been subject to severe trials in gales and storms, and even when covered with snow they have suffered no injury. The wire used is the ordinary commercial aluminum metal supplied by the British Aluminum Company. The aluminum procured had a conductivity of 51 per cent., taking copper equal to 100, and its chemical composition being 98.1 per cent. aluminum, the remaining part of 1.9 per cent. being an impurity, the greater part being iron. By practice, however, it is found that a span of 150 feet is the most suitable and reliable.

The jointing of the aluminum ends was done by an ordinary brass socket. A piece of yellow brass, 2 inches by 1.25 inches in diameter, was taken, and a hole bored right through it; this hole was tapped (Whitworth thread being used), the brass socket was then screwed on both ends of the aluminum. This joint has been very successful mechanically, and no failures have occurred in the joints made in this manner. The joint is subject to corrosion, but it is this corrosion which, peculiar to state,

*A communication in the "Electrical Review," London.



DEPOSITING VATS AT THE ELECTRICAL COOPER COMPANY'S WORKS, WILNES, ENG.

not emerged during 1900 from the experimental stages of their existence, with the one exception of the Hoepfner process. This process is in operation at the Winnington Works of Messrs. Brunner Mond & Co., in Cheshire, England, and also at Hruschau in Austrian Silicia. The zinc plant at the first named works is being extended, and electrolytic zinc obtained by this process was exhibited at the Paris Exhibition, so the method must be regarded as a practical success. Hoepfner has taken out so many patents relating to the extraction of zinc and other metal from their ores that it is difficult to arrive at the details of the process used. It is believed, however, that at Winnington zinc chloride solutions are obtained by aid of the waste calcium liquors from the ammonia soda process, and that these are electrolyzed in vats containing diaphragms and carbon anodes. The chlorine is thus obtained in the gaseous state, and can be used for the manufacture of chlorine products.

The Cowper-Coles extraction process, so far as the writer is aware, is not being operated upon an industrial scale at any place in England at present, and as the process is on the same lines as the discredited Ashcroft process, its ultimate success would seem doubtful.

The Swinburne dry fusion process has reached the second stage in its development, and the improved process is now being tried upon a small industrial scale at Milton in Staffordshire, with mixed sulphide ores supplied by the Tasmanian Copper Company. The

case, however, it is possible that electrolysis may ultimately be used for obtaining the zinc. Experimental work is now being carried on for the Fry process with reference to the electrolytic treatment of the zinc oxide obtained by the metallurgical portion of the process. The method now being tried consists in the electrolysis of a molten bath of zinc chloride into which the zinc oxide is fed, and the method is therefore somewhat similar to that patented by Swinburne.

There is nothing new to report in 1900 concerning the electro-galvanizing industry.

Wireless Telegraphy to be Tried Between Paris and Brussels.

Signor Guarini, the Italian electrician, who has been experimenting in Belgium with his wireless telegraphy apparatus, is now going to try and establish communication between Brussels and Paris. The distance, as the crow flies, is 171 miles, and therefore largely exceeds any attempt of a like kind hitherto made on land. The inventor proposes to use his patent retransmitters every seventeen miles, and they will be erected at the following places: Braine-le-Comte, Mons, Berlaimont, Wassigny, Moy, Coucy-le-Chateau, Villers-Cotterets, Betz and Mitry.

In order to telegraph direct from Brussels to Paris the antennae or pole apparatus would have to be placed at an elevation of 1,600 yards, with only three intermediary stations; a message would take an hour to manipulate and

makes it so mechanically safe. Joints were cut out and tested mechanically, and in all cases the aluminum could not be screwed out of the brass socket, and to open the joint the socket had to be sawn through. These joints were then placed in a testing machine, and in all cases the wire itself broke before the joint gave way, the tensile strength being equal to 16 tons per square inch. On close examination of the joint, a dark white oxide was present, and this was distributed over all the surface, and not a clear metallic surface was visible. It appeared evident that the joints had firmly oxidized together, though to no detrimental degree mechanically, but a rise in resistance was noticed in these joints when they were measured. A series of electrical tests was then made upon two sets of these joints. One set of joints was taken as samples after they had been made for one week, and the other set after they had been up, in practical use, for 12 months. In all cases it was found that the resistance of the old joints had increased 350 to 580 per cent. that of the new joints. It seems evident that, after a space of time, these joints will become total non-conductors, due to a complete film of oxide separating the two metals. But this time period will depend upon the tightness or fit of the metals. A badly-made joint may only last a short time, but a well-made one may last for years. After 15 months' working at Northallerton there has been no trouble through the joints discontinuing to conduct.

Through the above aluminum conductors and joints a current exceeding 200 amperes is passed at times of heavy load, and several joints were under observation, but no trouble arose, nor did any perceptible heating take place. The surface of the aluminum showed signs of oxidation or corrosion. It seemed pitted and eaten away more in some places than others, and all over the surface showed a darkish white deposit of oxide. The air at Northallerton, in Yorkshire, is said to be fairly pure; but the air is only one consideration, for the corrosion on the wires greatly depends upon the condition of the atmosphere. For instance, periodic sunshine and rain do more harm in assisting corrosion than a lengthy period of rain and sunshine; this is only natural, and is very marked in actual practice. Cases have come under observation where, during a rain storm, a good circuit was maintained through a joint, but after the rain ceased and the sun commenced to shine, the joint lost its conductivity, and finally was no good at all. The joint that was most affected by the above conditions was a copper and aluminum joint, and two aluminum joints were nearly as bad. The services of copper wire were taken off the main aluminums, and led overhead to insulators placed on the consumer's house wall. The greatest trouble experienced was with these joints, the copper wire being wrapped and bound round the aluminum, then insulated and protected from the weather by rubber tape and insulating paint. This class of joint was found the most lasting and suitable, but it gave trouble. The sun and rain used to play havoc with the joint, till finally it gave way. The greater part of these joints that ceased to conduct, ceased instantly, and it was no common occurrence on a windy night to have the consumer's lights bobbing up and down through these defective joints. A number of these fagged-out joints were examined, and although they were found to be perfectly tight they ceased to conduct, and on the resistance

being measured it was found to vary between 100,000 ohms and 2 megohms. Some of these copper wires that had been twisted round the aluminum were found to be strongly welded to it by the oxide, and by observation it looked to be a very good joint. The average life of this class of joint was about six months, and in no instance has a joint made between copper and aluminum been satisfactory. It remains to be seen whether a soldered joint will be as good mechanically and electrically as an ordinary made up joint. Soldering aluminum is simply melting it together, and it does not seem feasible that the melted joint will be as strong as a made up one; electrically it may be inferior. Soldered joints have never been tried at Northallerton, as the expense of trials would be too great, and most probably have led to inconvenience.

The copper mains have proved very satisfactory, and joints made by the hands, and left bare to atmospheric conditions, have given no trouble, and when measured electrically, under the same conditions as the aluminum, the increase of resistance was found to be only 5 per cent. The joints were found to be in a very good condition after being up under working conditions for over 12 months. With the copper mains, joints could be freely made by a man in a short space of time. With aluminum mains, to make a good joint took an experienced man twice as long, and then it could not be relied upon to last any length of time. It has been proved by actual experience that to use aluminum mains for distribution, the cost of same, including maintenance for a given period, exceeds that of copper under the same conditions. It can be said that aluminum is cheaper than copper, but this only holds good for the first cost, or cost of material. To place aluminum wires overhead requires experience and care, and the time taken during the operations amount to four times that of placing copper mains in position, that is when the conditions suitable for the erection of aluminum is at its very best. The maintenance, upkeep, etc., not mentioning the unreliability, etc., raises its total cost after one year to an amount equal to 10 per cent. of the total cost of copper installation under the same conditions, and this has been proved by actual experience. The general information obtainable simply states that aluminum is cheaper than copper for this purpose, but it omits the cost of erection and maintenance, which seem the two most important factors of the cost and success of the system after a period of time. From experience gained it seems evident that aluminum will be left alone when copper can be obtained and used for overhead constructional work. In an aluminum installation its first cost is less than a similar one of copper, but after one year's work its cost then exceeds that of the copper installation. It is very evident from experience gained by actual practical work on commercial lines that aluminum wire as an overhead conductor is very unsatisfactory. Of course, if this experience had been known at first, copper would have taken the place of aluminum in the above mentioned installation. Experience is a dear school, but it is the best.

CLARENCE MALTHANER, of the Mississippi Valley Telephone Company, has secured a patent on a new invention—a "trunking circuit"—which it is said materially facilitates long distance telephoning. The device consists of

the use of two condensers instead of repeating coils, which are used by the Bell system. By this method one may telephone to St. Paul almost as quickly as to any part of Minneapolis.

LONDON NOTES.

(From our London Correspondent.)

100 vs. 200 Volt Supply.

The long-expressed desire on the part of the London electric lighting companies to be placed in a position to compel consumers to change over from 100 to 200 volt supply, is forming the subject of a public inquiry now being held by the Board of Trade at Westminster. In one or two cases suppliers of electricity have been unable to obtain the economical advantages of supplying energy at the higher pressure, purely because two or three consumers have refused to concede to the wishes of the company. The companies have held out great inducements but without success. It will be evident that as the regulations now stand one or two such consumers are acting within their legal rights when they hinder the lighting authority from effecting very large saving in capital outlay and operating charges. The London County Council has ranged itself on the side of the consumers. The inquiry is practically set on foot by the action of the Westminster Electric Supply Corporation which has 5,500 consumers, all of whom are taking supply at 200 volts with the exception of eight. The corporation is at present therefore furnishing these eight consumers, scattered over a large district, at 100 volts. These eight are charged the maximum rate of supply permitted by regulation viz., 8d., but there is a considerable loss incurred. Already to make the conversion for other consumers, the corporation has expended about £45,000. These eight consumers are endeavoring now to dictate to the corporation the amount which shall be paid to them for agreeing to take 200 volts supply. The corporation resists this absolutely. The evidence given by Prof. Alexander Kennedy, the company's engineer, showed that in 1895 he advised making the change over to 200, and it was in 1897 that the change over commenced. He thought it was a mistake to think that there was any danger to the consumer from shock on account of the higher voltage. Nor did he think the danger from fire was greater, because more pains were taken about the fittings and the installation generally. There was a great saving in the loss by transmission when a high voltage was used, as compared with a low voltage. Their distribution loss at first was about 12½ per cent., but if they could change the whole of their system to 200 volt pressure, they could go on with a very much lessened loss, and it would be 21 years before they again arrived at a loss of 12½ per cent. At first the loss would be reduced to about 4½ per cent., but it would gradually increase. There would be considerable capital saving, and there would be a further advantage to the company, that it would not have to generate that 12½ per cent. of current which was lost in transmission. The consumers had benefited by a reduction in price of 8 per cent., and they had given them new lamps for old. He did not think that since 1897 there had been any electric undertaking of any importance in which lamps of a less voltage than 200 had been used. He did not think that there was any greater

eating away of the insulated material in a 200 power voltage than there was in the case of a lower power voltage, provided that proper material was put in.

Mr. W. A. Chamen, the city electrical engineer of Glasgow, gave evidence to the effect that his system had changed pressure from 100 volts to 150, 200 and 250 volts and only half a dozen consumers raised any objection.

Electrical Engineers and Mathematics.

Prof. John Perry, in his presidential address to the Institution last November, struck the keynote for many a subsequent lecturer on electrical engineering. His emphatic call for more modern and suitable methods of teaching mathematics in technical colleges, methods calculated to give the young electrical engineer a greater liking for mathematical calculation, has just been further endorsed by Prof. Lodge in his presidential address to the new Birmingham section of the Institution of Electrical Engineers. At the Manchester section a very similar attitude was assumed by Dr. Nicolson in a paper on the "Training of Electrical Engineers." Let us hope that these excellent orations will bear good fruit.

"Insulation on Cables."

A paper with this title came before the London body of the Institution of Electrical Engineers on March 7, the author being Mr. Mervyn O'Gorman. A reprint of the paper would fill something like fifty columns of *ELECTRICITY*. The title of the paper allowed of the inclusion of a great number of topics. The proofs were circulated among some of the members a couple of days before the meeting, but it would be a good day's occupation to read the paper so as to be prepared to join in the discussion, and most electrical engineers are too busily engaged at present for that. The paper consisted of over 100 numbered paragraphs and various appendices.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended March 13:

Antwerp, 14 packages, \$840; Argentine Republic, 165 cases, \$4,535; 33 packages, \$3,516; Australia, 33 cases, \$3,390; Barcelona, 5 packages, \$160; Berlin, 20 packages, \$622; Bordeaux, 80 cases, \$4,000; Brazil, 12 packages, \$1,365; Bristol, 236 packages, \$29,063; British East Indies, 7 packages, \$180; 8 cases, \$900; British Guiana, 28 cases, \$399; British Possessions in Africa, 86 packages, \$14,960; British West Indies, 44 packages, \$458; 2 cases cables, \$163; Chili, 4 packages, \$90; China, 3 cases, \$58; Cuba, 8 cases, \$1,026; 144 packages, \$2,803; 6 packages telephone supplies, \$1,246; Genoa, 126 packages, \$272; Gibraltar, 8 packages, \$776; Glasgow, 103 reels electric cable, \$28,294; 28 packages, \$2,729; Hamburg, 7 packages, \$1,074. Havre, 37 packages, \$2,342; Hong Kong, 82 packages, \$2,567; 1 case, \$195; Japan, 52 cases, \$7,061; 148 packages, \$15,946; Liverpool, 420 packages, \$44,448; 3 packages motor carriage material, \$287; London, 297 packages, \$30,380; 146 cases, \$11,817; 1 case cables, \$100; 18 packages motor vehicles and parts, \$8,750; Manchester, 11 packages, \$2,420; 3 cases, \$356; Naples, 1 box, \$60; New Zealand, 7 cases, \$315; Patros, 12 cases, \$740; Peru, 3 cases, \$70; Rotterdam, 2 packages, \$183; Sheffield, 5 cases, \$150; Southampton, 68 packages, \$1,900; 1 case, \$53; U. S. Colombia, 51 cases, \$980; Venezuela, 1 package, \$17.

PERSONAL MENTION.

Mr. Gilbert Wilkes, president of Gilbert Wilkes & Co., electrical engineers of Detroit and Denver, died in Denver March 10 from a hemorrhage of the lungs.

Mr. W. Frank Gitchell has accepted a position tendered him as controller of the British Columbia Electric Railway Company, with headquarters at Vancouver, B. C.

INCORPORATIONS.

The Southern Telegraph Company, Trenton, N. J. Capital stock, \$125,000.

The Caro & Lake Huron Electric Company, Caro, Mich. Capital stock, \$200,000.

The Acme Fuse Company of Baltimore, Dover, Del.—to deal in electrical appliances. Capital stock, \$100,000.

The Lyons Electric Railway Company, Lyons, N. Y. Capital stock, \$45,000. Directors: C. A. Lux, D. E. Lux and C. F. Lux, Clyde.

The Big Fork Electric Power & Light Company, Kalispel, Mont. Capital stock, \$100,000. Incorporators: C. E. Conrad, L. Tinkle and K. W. Tinkle.

The Lux Electric Light, Heat & Power Company, Clyde, N. Y. Capital stock, \$50,000. Directors: Charles A. Lux, D. E. Lux and C. F. Lux, Clyde.

The Ravens Electric Company, Coeymans, N. Y. Capital stock, \$19,000. Directors: Aldine Nodine and S. W. Mosher, Coeymans, and Nathaniel Niles, Albany.

The Warrenton Electric Company, Warrenton, Va. Capital stock, \$15,000. Incorporators: George B. Stone, president; Gen. Eppa Hunton, vice-president; F. D. Gaskins, secretary and treasurer.

The Gloversville Citizens' Electric Company, Gloversville, N. Y.—to supply electricity to Gloversville, Johnstown, Northville and Broad Albin. Capital stock, \$40,000. Directors: John Begley, F. S. Sexton and Ervin Klein, Gloversville.

The New Idea Attraction Company, Elizabeth, N. J.—to deal in ornaments, stationery, pictures, art treasures and electrical devices. Capital stock, \$30,000. Incorporators: James V. Freeman of Woodbridge, Lydia A. Pitt and Frank D. Higbee of New York City.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED MARCH 12, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

669,850. System of Electric Propulsion. Richard B. Pailton, Williamsport, Pa. Filed April 11, 1899. Renewed Dec. 20, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

669,546. Portable Electric Lamp. Morris Newgold, New York City. Filed March 8, 1900.

669,590. Electric Lamp. Marshall W. Hanks, Pittsburg, Pa., assignor to George Westinghouse, same place. Filed June 7, 1900.

669,594. Magazine Ballast for Electric Lamps. Henry N. Potter, Pittsburg, Pa., assignor to George Westinghouse, same place. Filed June 4, 1900.

669,610. Making Glowlers for Electric Lamps. Alexander J. Wurts and Marshall W. Hanks, Pittsburg, Pa., assignors to George Westinghouse, same place. Filed June 7, 1900.

669,613. Dynamo Electric Machine or Electric Motor. Norman C. Bassett, Lynn, Mass., assignor to the General Electric Company of New York. Filed Jan. 18, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

669,538. Electric Switch. Thomas G. Meinema, Morton Park, Ill., assignor to Edward W. Hammer, Chicago, Ill. Filed March 1, 1900.

669,573. Dynamo-Electric Machine. Amos R. Bliss, Lowell, Mass., assignor to the New England Motor Company of Massachusetts. Filed June 25, 1900.

669,574-669,575. Dynamo-Electric Machine. Donald M. Bliss, Lowell, Mass., assignor to the New England Motor Company of Massachusetts. Filed Feb. 19, 1900, July 9, 1900.

669,595. Electrical Controller. Charles R. Reynolds, Hartford, Conn., assignor to Henry J. Cogswell and Halsey B. Philbrick, same place. Filed March 2, 1900.

669,662. Multiphase Transformer. Edwin W. Rice, Jr., Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Dec. 14, 1898.

669,670. Electrical Measuring Instrument. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company of New York. Filed June 25, 1900.

669,706. Electric Switch. Willard F. Richards, Buffalo, N. Y., assignor to Charles M. Gould, New York City. Filed Nov. 20, 1899.

669,759. Electric Motor. Charles Milde, Paris, France, as-

signor to Ste. Ch. Milde Fils et Cie., same place. Filed Aug. 22, 1900.

669,802. Electrical Device for Converting Alternating Currents. Albert Nodon, Paris, France. Filed Sept. 6, 1900.

669,803. Dynamo. Charles A. Parsons and George G. Stoney, Newcastle-upon-Tyne, England. Filed Dec. 15, 1900.

669,823. Electric-Lamp Controller and Rheostat. Andrew H. Dreijer, Brooklyn, N. Y. Filed April 23, 1900.

669,940. Rectifier for Electric Currents. Franklin M. Gilbert, St. Paul, Minn., and George K. Wheeler, Topeka, Kan., assignors to the Electric Axle Light & Power Company, New York City. Filed Dec. 17, 1898.

669,941. Electric Switch. Franklin M. Gilbert, St. Paul, Minn., and George K. Wheeler, Topeka, Kan., assignors to the Electric Axle Light & Power Company, New York City. Filed Dec. 17, 1898.

TELEPHONES AND TELEPHONE APPARATUS.

669,501. Supervisory Signal Apparatus for Telephone-Switchboards. Oro A. Bell, New York City, assignor to the Western Electric Company, Chicago, Ill. Filed July 31, 1899.

669,544. Apparatus for Party Telephone-Lines. Frank R. McBerty, Downer's Grove, Ill., assignor to the Western Electric Company, Chicago, Ill. Filed May 21, 1898.

668,545. Apparatus and Circuit for Telephone-Switchboards. Frank R. McBerty, Evanston, Ill., assignor to the Western Electric Company, Chicago, Ill. Filed June 12, 1899.

669,707. Telephone-Exchange System. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Nov. 12, 1894.

669,708. Apparatus for Telephone-Switchboards. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Feb. 28, 1895.

669,709. Supervisory Signal for Telephone Switchboards. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Nov. 23, 1895.

669,710. Telephone-Circuit. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Nov. 18, 1897. Renewed Sept. 4, 1900.

669,792. Combined Telephone and Alarm System. Angus S. Hibbard, Chicago, Ill. Filed July 7, 1900.

669,800. Telephone-Receiver Holder. George S. Meyer, Newburg, N. Y. Filed Dec. 8, 1900.

669,832. Combined Telephone and Fire-Alarm Apparatus. Angus S. Hibbard, Chicago, Ill. Filed July 7, 1900.

669,875. Coin-Controlled Telephone. Julio E. Cordovez, Panama, Colombia. Filed Aug. 16, 1900.

669,900. Telephone Service-Meter and Circuit. David S. Hulfish, Chicago, Ill., assignor to the American Bell Telephone Company, Boston, Mass. Filed Dec. 18, 1900.

669,901. System of Central Current-Supply for Private-Line Telephone-Circuits. Malcolm C. Rorty, Dedham, Mass., assignor to the American Bell Telephone Company, Boston, Mass. Filed Oct. 4, 1900.

669,944. Telephone. Albion P. Merrill and Jenny W. Hays, San Francisco, Cal. Filed Jan. 10, 1900.

MISCELLANEOUS.

669,517. Binding-Post for Electrical Connections. Alexander Fischer, New York City. Filed Feb. 19, 1900.

669,543. Electric Gas-Igniter. Oscar von Morstein, Berlin, Germany. Filed Dec. 8, 1896.

669,556. Electrical Pliers. Francis L. Spring, Townsend, Mass. Filed June 13, 1900.

669,577. Casing for Electric Motors. Charles A. Eck, Newark, N. J. Filed Oct. 30, 1900.

669,619. Device for Adjusting Electric Appliances to the Human Body. James Charles, Richmond, Ind. Filed Jan. 14, 1901.

669,640. Electrically-Operated Pump. Edward M. Hewlett, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Dec. 4, 1899.

669,644. Signal or Alarm. Paul M. Jerrard, Johannesburg, South African Republic. Filed Oct. 5, 1900.

669,691. Insulator for Electric Wires. Morton Harloe, Hawley, Pa., assignor of one-half to Wilton S. Bloes, Peckville, Pa. Filed Sept. 19, 1900.

669,732. Electrolytic Apparatus. Paul W. Knauf, Philadelphia, Pa., assignor to the Electrical Lead Reduction Company, same place. Filed July 17, 1900.

669,834. Primary Battery. Charles A. Hussey, New York City. Filed July 24, 1900.

669,926. Process of Electrolytical Extraction of Metals. Carl Hoefpner, Frankfurt-on-the-Main, Germany. Filed Sept. 27, 1899.

669,942. System for Generating and Distributing Electric Currents. Franklin M. Gilbert, St. Paul, Minn., and George K. Wheeler, Topeka, Kan., assignors to the Electric Axle Light & Power Company, New York City. Filed Dec. 17, 1898.

669,968. Induction Coil. Leonidas G. Woolley, Kenton, O. Filed July 18, 1900.

DESIGN.

34,211. Insulating Support for Electrical Conductors. Lewis B. Stillwell, Niagara Falls, N. Y. Filed Dec. 18, 1900. Term of patent 14 years.

THE TELEPHONE WORLD.

Chicago to Have New 'Phone Company.

An ordinance was recommended to the council last week granting a franchise to the United Telegraph, Telephone & Electric Company of Hyde Park, which will be under contract to furnish service at a little more than half the rates of the Chicago Telephone Company.

The measure was previously passed by the committee on gas, oil and electric light.

The Cairo, Ill., Telephone Company has sold its telephone system to Messrs. John S. Alsthorpe and Marion C. Wright. The Cairo Telephone Company was organized about five years ago by Messrs. Thomas W. Gannon and Angus Leek. Besides the local exchange it owned lines to Mound City, Villa Ridge and Vienna, and also in Southeast Missouri and Western Kentucky. The new owners will take charge on April 1, and it is understood that they will continue it as an independent system and will immediately begin work on proposed improvements.

A company has been formed to build a telephone exchange in Polo, Mo. The officers of the company are F. M. Kern, president; M. H. Winger, secretary and treasurer; J. W. Houston, J. D. Vanolinda, C. C. Hopkins, J. B. Bathgate and T. J. Campbell, directors. A farmers' telephone company has also been organized to connect Polo with Lathrop, Mirabile and Kingston, Mo.

All of the cars of the new Toledo, Fostoria & Findlay, O., Electric Railway Company will be equipped with telephones, an innovation which will be a great convenience to patrons. The instruments will be regulation affairs, and connection will be made with the telephone wire strung along the right of way by means of a jointed rod. The line will be a private one and constructed of copper wire.

The directors of the Providence, R. I., Telephone Company have voted to increase the capital stock of the company to \$1,600,000 by the issue of new stock to the amount of \$400,000, the stock to be offered at par (\$50 a share) to stockholders of record March 20, 1901, in proportion of one share of new stock for every three held on the date mentioned.

The United Telephone & Telegraph Company of Philadelphia has absorbed the local Independent Telephone Company of Lebanon, Pa., the deeds having been recorded. The consideration mentioned in the deed is \$75,000.

There is a rumor that a Ludlow, Ky., company will organize with a capital of \$15,000, with the intention of purchasing the telephone system owned by the Kentucky Electric Company. Connection will be made with the telephone system in Cincinnati, O.

The farmers south of Humboldt, Neb., have started an independent telephone line for their own convenience and have selected committees to push the work among their neighbors. The line if completed will be connected with the independent system of Humboldt.

Fitchburg and Leominster, Mass., capitalists have asked for a franchise for the Fitchburg & Leominster Telephone Company, which proposes to compete with the Bell interests. State Senator Blodgett is among those interested in the new company.

A telephone line is to be built from Darien to Bennington, N. Y., the coming season. This will relieve the latter town of the distinction of being the only town in Wyoming County without telephone service.

The Harriman, Tenn., city council recently granted a franchise to the Citizens' Mutual Telephone Company for a term of ten years. It is expected that the new company will begin the erection of its plant soon.

The Bedford, Ind., city council has granted franchises to three new telephone companies, the Hoosier Telephone Company being the largest. Exchanges will be put in and war will be made against the Central Union Company.

The Southern States Telephone Company is having a new cable laid between Norfolk and Berkeley, Va. This cable is much larger than the one formerly used, and it is hoped that the new one will give better service.

Mayor Leader, of Reading, Pa., lately signed the ordinance granting street rights to the Schuylkill Valley Telephone Company, which promises to give good service at a greatly reduced figure.

A telephone line 18 miles long has been completed to Minkka, Fla., and has been pronounced the best in Manatee County.

Reorganization of the Telephone, Telegraph & Cable Company.

Independent telephone interests in New York City and Boston were recently surprised to hear, says the N. Y. "Commercial," that William J. Latta, the president of the Telephone, Telegraph & Cable Company of America, has resigned, and that the management had determined upon radical changes in the policy of that company.

One of the most important of these is that an immense scaling in capitalization has been decided upon and a more conservative attitude in the development of the independent telephone industry of the country will be adopted by the board of directors.

In the official announcement made March 14, the statement was made that the capital stock will be reduced from \$30,000,000 to \$9,000,000, and the par value of the shares will be \$15 instead of \$50. By the reduction the assessable feature of the stock will be fully terminated to that amount. The shares will thus be full paid, the circular states, and will be unassessable thereafter.

Not the least important part of the circular is the statement that the office of president of the Telephone, Telegraph & Cable Company of America has been left vacant for the present.

In the interim Henry R. Wilson, one of the directors and vice-presidents, is acting in the place vacated by Mr. Latta. It is understood that Mr. Latta resigned owing to dissatisfaction expressed over the condition of the company, and it is said that the office will not be filled until a thoroughly capable independent telephone man has been found who will carry on the fight against the Bell.

Mr. Latta is still a member of the board of directors, and has been chosen to fill his old place as a member of the executive committee.

The independent telephone movement will be carried on and extensive plans are now being prepared which will be laid before the stockholders in a short time. In the meantime the directors call attention to the fact that a number of assessments have not been paid, and the hope is expressed that all delinquent stockholders will meet their obligations without further action by the directors.

The Butler Western Telephone Company of Hamilton, O., has made application to the county commissioners for a supplemental franchise on the river road to Venice. The original intention of the telephone promoters to run over the New London and Colerain, Oxford and Brookville turnpikes, to Hamilton and Venice will be altered accordingly. It is claimed that an independent telephone company will shortly apply to the county commissioners for a franchise to connect Oxford, Mixerville, Springfield and Brookville with a line over the Oxford, Mixerville and Brookville turnpike.

Arrangements have been made between the La Crosse, Wis., Telephone Company, an independent company, and all independent lines between La Crosse and Milwaukee, whereby connections can be made for long-distance service. It is proposed to build a line from La Crosse east as soon as frost leaves the ground. The line will be built by way of Sparta, Baraboo and Madison, and will consist of a solid copper wire.

A new telephone line is being erected between Branch via Lucas and Grove, to McKinney, Tenn., which now leads all others in the State in point of density of rural population, and is threaded by a perfect network of telephones, extending to all of its many rural postoffices and villages. Most of these telephone systems are owned and operated by citizens of the places mostly benefited.

The Cumberland Telephone & Telegraph Company is negotiating for the purchase of the line owned and operated by the Ducktown, Tenn., Telephone Company, and should it make the purchase, it will put in a local exchange and extend its line from Benton to Ducktown by way of Parksville and Ocoee River and will give the people of Ducktown long-distance service, which is badly needed.

The new telephone company in New Berlin, N. Y., has its line nearly completed. All of the business places and a large number of residences have been wired and the success of the project is practically assured.

Street telephones similar to fire alarm boxes are to be placed at the street corners in New Haven, Conn. A nickel opens the wire for talk.

The Citizens' Telephone Exchange of Lawrenceburg, Tenn., will shortly be extended to Pulaski in that State.

The Cumberland Telephone Company will make extensive improvements in Greene County, Tenn.

Additional Telephone Lines.

The general deficiency bill, which passed at the recent session of Congress, provided the sum of \$1,478.18 for the general expenses of the District electrical department and the telephone and telegraph service. This amount included an item for the establishment of five additional trunk lines between the telephone switchboard at headquarters and the exchange of the Chesapeake & Potomac Telephone Company, and the Commissioners have directed the electrical engineer to have these additional trunk lines installed, there being urgent need of them.

Telephonic connections complete, far-reaching and cheap, not only between the large cities, but also between every village and hamlet in Erie County and Western New York are the considerations promised by the National Telephone Association in return for the right to establish a competing telephone system in Buffalo and vicinity. The association is a combination of independent telephone companies. Among the cities in which the local companies have membership in the National Association are St. Louis, Chicago, Pittsburg and Indianapolis. The Queen City Telephone Company is also in the association, and when its lines are set up, it will be connected with Tonawanda, Niagara Falls, Syracuse, Rochester and other cities. More than this, it will also bring into the National Association many of the smaller towns which have their own local company.

Richard Hankins, of the Overton Telephone Company, has lately been in Cookeville, Tenn., for the purpose of interesting local parties in his company. A meeting was held at which Mr. Hankins stated that if the citizens of Putnam County would subscribe to the capital stock of his company it would build its lines to Cookeville and place an exchange in that city. A committee was appointed to draw up a contract, formulate a schedule of rates and ascertain how many 'phones would be subscribed for in Cookeville. This company has a line from Algood to Byrdstown, Tenn., with some short lines reaching into the surrounding territory.

The switchboard of the Olneyville, R. I., telephone exchange that is about completed is designed for a thousand lines. The board is equipped with a system of self-restoring noiseless drops. In the new board the drop will automatically be restored to its place by the action of the operator inserting the plug to ascertain the desire of the subscriber, and to make the desired connection. In conjunction with the opening of the new exchange, all overhead telephone wires in Olneyville Square will be dispensed with. Already all the lines to be connected with the new exchange are placed in conduits underground and they enter the exchange in four cables, each provided with 240 pairs of wires.

A recent rain and thunder storm in Texarkana, Ark., carried destruction in its wake. Every telephone line entering that place was prostrated and the Postal and Western Union Telegraph Companies lost all of their wires with the exception of two or three lines in their Western outlets.

The new telephone exchange for Tuscumbia, Ala., has been completed and is now in thorough working order.

The telephone line between Glenmore and Taberg, N. Y., was completed recently.

TELEPHONE INCORPORATIONS.

The Gardner Telephone Company, Gardner, Kan. Capital stock, \$5,000.

The Citizens' Telephone Company, Bath, N. Y. Capital stock, \$10,000. Directors: B. G. Hubbell, C. E. Stowe and J. H. Fuller, Cleveland, O.

The Pittsboro Telephone Company, Pittsboro, Ind. Capital stock, \$3,000. Directors: Charles R. Sowden, W. D. Lewis and Samuel James.

The Farmers' Telephone Company of Harrison County, Bethany, Mo. Capital stock, \$2,500. Incorporators: C. H. Neil, W. H. Springer, R. J. Goodrich and others.

The Independent Telephone Company, Chicago. Capital stock, \$3,000. Incorporators: Arthur W. Underwood, I. F. Dunwiddle and J. J. Comer.

The Cambridge Mutual Telephone Company, Cambridge, Ill. Capital stock, \$2,500. Incorporators: Theodore Boltensstein, Ernestine Boltensstein and Victor Boltensstein.

The Columbus Junction Telephone Company, Columbus Junction, Ia. Capital stock \$8,000. Incorporators: N. F. Hendrix, F. M. Molsberry, A. S. Thompson and A. C. Kelly.

GENERAL ELECTRICAL NEWS.

Lighting.

Alto Pass Ill.—This town is to have electric lights for the streets in the near future.

Aneta, N. D.—The citizens of this place are agitating the question of erecting an electric light plant.

Armada, Mich.—The citizens of this place are agitating the question of erecting an electric light system.

Ashland, Wis.—The Chicago & Northwestern is figuring on putting in an electric lighting plant here to furnish light for the company's dock and railroad yards.

Bristol, Tenn.—The Legislature will be petitioned for authority to issue \$25,000 bonds for erecting an electric light plant here.

Bluffton, Ind.—Ober & Mann contemplate erecting an incandescent lighting plant in this place providing the council will give them a franchise.

Charleston, S. C.—St. J. A. Lawton, 43 South Bay street, this city, wants bids on an electric light plant, etc., for a hotel.

Clarence, Mo.—This city will hold an election to decide the issuance of bonds for an electric light plant.

Cloverport, Ky.—J. Hook of this place contemplates the erection of an electric light plant.

Des Moines, Ia.—The Dewitt Electric Light & Power Company has increased its capital stock from \$3,000 to \$9,000.

Eden Valley, Minn.—This village will in the spring erect an electric light plant.

Elkhart, Ind.—Leading business men and capitalists of this city will organize a new electric light company and a petition for a franchise will soon be presented to the city council.

Greenwood, Ind.—A water and electric light franchise was lately granted to L. K. Davis, consulting engineer of the water company of this city.

Iron River, Mich.—The project of a municipal electric lighting plant is being discussed here.

Jersey Shore, Pa.—It is stated that the Jersey Shore electric lighting plant is to be sold.

Kendallville, Ind.—This town is preparing to erect an electric light plant.

Kenosha, Wis.—A number of Chicago and Kenosha capitalists are making an effort to organize a new electric light and power company here. W. L. Russell of Chicago is at the head of the enterprise.

Manton, Mich.—Bonds will be issued here for the establishment of an electric light plant.

Midlothian, Tex.—Negotiations are pending for the establishment of an electric light plant here.

Mineral Ridge, O.—The city council is considering the question of having electric street lights.

New Ulm, Minn.—At the coming municipal election the question of issuing \$30,000 in bonds will be voted on for building an electric light plant.

Peoria, Ill.—A special meeting of supervisors will be held March 27 for the purpose of discussing the matter of installing an electric light plant at the courthouse and jail in this city.

Sheffield, Mass.—An electric light plant is being talked of for this place.

Shoshone, Idaho.—I. B. Perrine is at the head of a project to establish an electric light plant to cost \$30,000. The plant will be located at Blue Lakes and will furnish electric light and heat for this place.

St. Joseph, Mich.—A short time ago the question of municipal ownership of an electric light plant in this city was decided and the city proposes to erect an electric light plant costing about \$12,000.

Summitville, Ind.—An electric light company was recently formed here and has been granted a franchise for lighting the town. W. F. Custer is president of the company.

Tabor, Ia.—An election will be held March 25 to vote on the question of granting a franchise to the Tabor Water & Light Company for the erection of an electric light plant.

Two Rivers, Wis.—It was voted at a recent election to bond the city for \$20,000 to pay one-third of the cost of the electric light and waterworks plant. The system will be completed by September 1.

Utica, Ill.—H. B. Grove of Little Rock, Ark., is trying to get a franchise for the erection of an electric light plant for this place.

Waterloo, Neb.—The citizens of this place are considering the question of erecting an electric light plant.

West Chester, Pa.—Preparations are being made to enlarge the electric light plant here.

Winfield, Kan.—An election will be held to vote on the question of issuing bonds for the purpose of erecting an electric light plant.

Street Railways.

Atlanta, Ga.—The Atlanta Rapid Transit Company has secured a franchise from the city authorities to build its proposed line in this city.

Bakersfield, Cal.—A franchise has been granted to the Mountain Valley & Bakersfield Railway Company to construct an electric car line from this city to the Kern River oil fields. The work of construction will be commenced within three months.

Bryan, O.—At the city council meeting last week a franchise was granted to W. D. Sherwood as trustee of the Northern Ohio Electric Railway Company for the construction of a trolley line from Defiance, to be completed within 18 months.

Canaan, Conn.—A company is being organized for the construction of an electric road from the Massachusetts State line north of here to Bridgeport, a distance of 70 miles. The plan is to have this road connect with the proposed Berkshire line from the State boundary to Pittsfield, Mass., and with its connections form a continuous line to New York City.

Cape May, N. J.—A syndicate of New York, Philadelphia and Baltimore men, at the head of which is A. B. Wilgus, Jr., of New York, last week purchased the beach front trolley road of the Cape May, Delaware Bay and Sewell's Point Railroad Company for \$90,000.

Cleveland, O.—The Cleveland Southern Electric Railroad, to run from this city to Wooster via Cleveland and Berea, has been organized and the road is expected to be in operation during the summer. Cleveland capitalists are behind the road. The officers are W. H. Lamprecht, president; A. H. Pomeroy, vice-president; F. H. Fuller, secretary, and F. T. Pomeroy, treasurer. The capitalization is \$1,000,000.

Elmira, N. Y.—There is some talk of a trolley line connecting Elmira and Binghamton by way of Sayre, Waverly and Athens.

Galena, Kan.—N. F. Moore has been granted an electric railway franchise. The line will be owned by Pennsylvania capitalists. It is the intention of the company to form a belt of the line, taking in the lead and zinc coal fields of this section. It is understood that the line will extend through Webb City, Joplin, Galena, Baxter, Columbus and Pittsburg.

Lexington, Ky.—An electric road from here to North Middletown suggested.

Louisville, Ky.—The proposed New Albany, Jeffersonville and Sellersburg electric line to connect the latter town with the two cities as well as Louisville seems to be a certainty.

Manheim, Pa.—The Strasburg and the Manheim electric road will be built next summer.

Ravenna, O.—The county commissioners have granted the Northern Ohio Traction Company a franchise for an electric railway between this place and Kent via Lake Brady.

Red Bud, Ill.—The Belleville Traction Company has decided to build an electric line through several nearby cities, the terminus to be at this place.

Richmond, Ind.—Messrs. McDonald & Cross are the promoters of an electric line from Dayton, O., to this city.

Scotia, N. Y.—The Scotia Traction Company has been organized to operate an electric street railroad from a point on the Fitchburg Railroad in this place to Schenectady with a capital of \$30,000. G. W. Lynch and William H. Delauey, New York City, H. V. Mynderse, Schenectady, are the directors.

Manufacturing.

Chicago.—The Benton & Walker Manufacturing Company, with a capital of \$2,500, will manufacture mechanical and electrical goods. Frank J. Walker, George A. Benton and Davis F. Matchett are at the head of the concern.—The International Specialty Company of this city, capitalized at \$2,500, is manufacturing electrical specialties. Samuel W. Norton, Samuel J. Lumbard and James O. Broder hold an interest in the firm.—The Federal Electric Company has been formed for the purpose of manufacturing electrical devices with a capital of \$2,500. Henry M. Bates, Evans Holbrook and Edward Frey are the promoters.

Cleveland, O.—The Sterling Electrical Manufacturing Company of this city has lately been organized with a capital of \$45,000.

Danbury, Conn.—M. Burton Rogers of this place has purchased controlling interest in the Russell-Tomlinson Company of Milford, manufacturers of electrical appliances. It is said that the company will remove its works to Danbury.

Detroit, Mich.—A short time ago the Capital Electric Manufacturing Company filed articles of incorporation with the county clerk, and will manufacture electrical devices and appliances in this city upon a capital stock of \$30,000. Arthur L. Bresler, T. George Rakestraw, William T. Bowen and Eugene A. Bresler are the stockholders.

Manchester, Va.—In the new factory of Willis & Scott in this city will be manufactured all kinds of electrical appliances and machinery. It will give employment to between 500 and 600 skilled operatives.

New York City.—The Magneto Electric Company has been formed to manufacture and acquire electric rights with a capital of \$1,000,000. Louis E. Niles of Springfield, O.; William S. Van Brocklyn, of Amsterdam, N. Y., and William P. Rower, of Troy, N. Y., are interested in the concern.—L. E. Safford, Joseph G. Quinn and Eugene Berry, all of this city, hold an interest in the Safford Electric Manufacturing Company, capitalized at \$250,000, to manufacture electric appliances, apparatus, etc.

Niles, O.—A company composed of Niles capitalists has been formed to manufacture electric lamps and transformers.

South Norwalk, Conn.—It is probable that electric signals will be turned out at the plant that the new firm of Thompson, McKibbin & Co., intend to establish in this place.

Syracuse, N. Y.—A new manufacturing concern, capitalized at \$100,000, and known as the Milloy Automatic Trolley Catcher Company, is located here. J. P. Devine is president, P. D. Milloy vice-president and general manager, William S. Farmer treasurer, and Mr. Tanner secretary.

Company Matters.

Indianapolis, Ind.—The Commercial Electric Company, located in this city, with a capital stock of \$33,700, is licensed to transact business in Illinois with a State capital of \$2,500.

Le Roy, N. Y.—The Le Roy Hydraulic Electric Company is now contemplating the enlargement of its plant. This will probably be done during the coming summer, in which case larger dynamos will be put in for furnishing power for manufacturing purposes and all other requirements.

Automobiles.

Richmond, Va.—An automobile factory will probably be located here. R. W. Coffee is interested in the movement.

Waltham, Me.—The Waltham Automobile Company has been incorporated under the laws of Maine with a capital of \$50,000. The officers are W. L. Carney, president, and Jacob Merrill, treasurer.

Weyauwega, Wis.—The first appearance of an automobile was made on the streets of this city a short time ago.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by **ELECTRICITY** from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Authorz'd	Issued.				
Albany, N. Y.—Mar 18.					
United Traction.....	100	\$5,000,000	\$5,000,000	1 1/2 % Q.	109 110
(Consolidation of the Albany and Troy City Railway.)					
Allentown Pa.—Mar 18					
Allentown & Lehigh Val. Trac. Co	....	4,000,000	1,500,000	.....	— 15
Bridgeport, Conn.—Mar 18 :					
Bridgeport Traction Co.....	100	2,000,000	2,000,000	1 % Aug.,	100 —
Baltimore Md.—Mar 18					
a United Railways & Elec. Co., com.	50	24,000,000	18,000,000	.....	15 1/2 16
Boston, Mass.—Mar 18					
New England Street Ry.....	25	5,000,000	1,081,925	1 % Q., Jan. 15,	— —
North Shore Traction Co., com.	100	4,000,000	4,000,000	.....	15 16
North Shore Traction Co., pfd.	100	2,000,000	2,000,000	5 % S. A. & O.	85 87
b West End Street Ry. Co., com.	50	10,000,000	9,385,000	3 1/2 % S. Oct., '99.	98 98 1/2
West End Street Ry. Co., 8 % pfd.	50	4,400,000	6,400,000	4 % S., Jan.	112 113
Boston Elevated R. R.....	100	10,000,000	.....	2 1/2 % Aug. 99,	168 1/2 169
Brooklyn N. Y.—Mar 18:					
Brooklyn City Ry.....	100	2,000,000	1,928,400	.....	235 240
Brooklyn Rap. Transit Co., tr. certif.	100	48,000,000	48,000,000	.....	82 1/2 82 1/2
Brooklyn Heights Railroad.....	100	200,000	200,000	.....	107 109
d Brooklyn City RR..... guar.	100	12,000,000	12,000,000	8 1/2 % Q., Jan.,	287 289
Brooklyn, Queens Co. & Sub. RR.	100	2,000,000	2,000,000	.....	— —
Coney Island & Brooklyn RR.....	100	2,000,000	1,884,200	2 1/2 % Nov., '99.	325 332
Kings County Elevated.....	100	4,750,000	4,750,000	.....	— —
Kings County Traction Co.....	100	4,500,000	4,500,000	1 % July	75 80
Nassau Electric Railroad..... pfd.	50	6,000,000	6,000,000	.....	— —
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000	.....	— —
Brooklyn, B. & W. E. Railroad.....	100	1,000,000	1,000,000	.....	— —
Buffalo N. Y.—Mar 18					
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	.....	74 75
* Buffalo Railway Co.....	100	6,000,000	5,870,500	1 % Q. Dec., '99.	99 100
Columbus O.—Mar 18					
Columbus Street Railroad.....	100	8,000,000	8,000,000	1 % Q., Feb.	36 39
Columbus Street Railroad, pfd.....	100	1,500,000	1,500,000	.....	92 98
Charleston, S. C.—Mar 18					
Charleston City Ry. Co.....	50	100,000	100,000	8 % S.	— —
Enterprise City RR. Co.....	25	1,000,000	250,000	.....	— —
Chicago, Ill.—Mar 18					
Chicago City Ry. Co.....	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99.	255 263
Chicago & South Side R. T. RR.....	100	10,828,800	10,828,800	.....	— 9 1/2
Lake Street Elevated RR.....	100	10,000,000	10,000,000	.....	90 103
Metropolitan West Side Elev. Ry....	100	15,000,000	7,000,000	Feb 28 1900.	32 1/2 80
Met. West Side El., pfd.....	107	15,000,000	9,000,000	.....	209 210
North Chicago Street RR.....	100	10,000,000	6,600,000	8 % Q., Jan.	197 200
North Chicago City RR.....	100	500,000	249,900	.....	99 101
South Chicago City Railway.....	100	2,000,000	1,608,200	.....	101 103
West Chicago St. RR. Co.....	100	20,000,000	18,189,000	1 1/2 % Q., Feb.	15 15 1/2
Union Traction Ry..... com.	100	1,250,000	624,900	8 1/2 % S.	56 56 1/2
Union Traction Co..... pfd.	100	2,000,000	2,000,000	.....	— —
Cincinnati, Ohio.—Mar 18:					
Cincinnati Inc. Plane Ry..... com.	50	1,000,000	875,000	.....	— —
Cincinnati Inc. Plane Ry..... pfd.	50	150,000	150,000	.....	75 76
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2 % Feb.	124 125
Cincinnati Street Ry. Co.....	50	18,000,000	14,000,000	1 1/2 % Q., Jan.	128 129
Mt. Adams & Eden Park Inc. Ry.....	50	2,500,000	2,200,000	1 % Q., Jan.	— —
Cleveland, Ohio.—Mar 18:					
Akron, Bed. & Cleve. Elec. Ry.....	100	1,000,000	1,000,000	3/4 % Jan.	48 50
Cleveland City Ry.....	100	8,000,000	7,600,000	8-5 % Jan.	102 103 1/2
Cleveland Electric Ry.....	100	12,000,000	12,000,000	3/4 % Q., Oct., '99.	83 84 1/2
Detroit, Mich.—Mar 18					
Detroit Citizens' Street Ry.....	100	2,000,000	1,250,000	.....	100 —
Fl. Wayne & Belle Isle Ry.....	100	.....	1,200,000	.....	175 —
Rapid Railway Co.....	100	250,000	250,000	.....	90 100
Detroit Electric Railway.....	100	1,000,000	1,000,000	.....	— —
Wyandotte & Detroit River Ry.....	100	250,000	200,000	.....	100 110
Dayton O.—Mar 18					
City Railway Co..... com.	100	1,500,000	1,470,600	1 1/2 % Q.	140 145
City Railway Co..... pfd.	100	600,000	600,000	1 1/2 % Q.	170 —
People's Street Railway.....	100	1,100,000	1,100,000	.....	114 115

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Authorz'd	Issued.				
Hartford Conn.—Mar 18					
Hartford Street Ry. Co.....	100	\$4,000,000	\$200,000	8 % S., Oct.,	150 —
Hartford & West Hartford RR.....	100	1,000,000	247,000	.....	— —
Holyoke Mass.—Mar 18					
Holyoke Street Ry. Co.....	100	400,000	400,000	8 % A., June,	207 1/2 212
Hoboken N. J.—Mar 18					
North Hudson Co. (N. J.) Ry. Co....	25	1,250,000	1,000,000	8 %	150 —
Indianapolis, Ind.—Mar 18					
** Indianapolis Street Ry.....	....	5,000,000	5,000,000	.....	27 29
Lancaster, Pa.—Mar 18					
Pennsylvania Traction Co.....	100	10,000,000	9,900,000	.....	— —
Lancaster & Col. Electric Ry.....	....	.....	87,500	.....	— —
West End Street Railway.....	....	.....	.....	.....	— —
Louisville, Ky.—Mar 18:					
Louisville Ry..... com.	100	4,000,000	8,500,000	1 1/2 %	82 83
Louisville Ry..... pfd	100	2,500,000	2,500,000	2 1/2 % S., Oct. 1,	112 113
Minneapolis, Minn.—Mar 18					
Twin City Rapid Transit..... com.	100	17,000,000	15,010,000	.....	68 1/2 69 1/2
Twin City Rapid Transit..... pfd	....	8,000,000	1,712,200	1 1/2 % Oct.,	186 187
Montreal, Canada.—Mar 18					
Montreal Street Ry. Co.....	50	4,000,000	4,000,000	8 % S. M. & N.	268 1/2 265
Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1 1/2 % S. J. & J.	106 1/2 109 1/2
Memphis Tenn.—Mar 18:					
Memphis Street Railway Co.....	100	500,000	500,000	.....	25 —
New Haven, Conn.—Mar 18:					
Fair Haven & Westville RR.....	25	2,000,000	2,000,000	8 % S., Sept.	89 41
New Haven Street Railway Co.....	100	1,250,000	1,000,000	2 1/2 % A., July	— —
New Haven & Centerville.....	100	700,000	800,000	.....	— —
Winchester Avenue RR.....	25	1,000,000	600,000	.....	45 46
New Orleans, La.—Mar 18					
Canal & Claiborne RR. Co.....	40	240,000	240,000	4 % S., July,	— —
New Orleans & Carrollton RR.....	100	1,200,000	1,200,000	1 1/2 % Q., Oct.	148 1/2 158
New Orleans Traction Co new com.	100	.....	.....	.....	22 1/2 24
New Orleans Traction Co new pfd.	100	.....	.....	.....	96 96
a Crescent City RR..... guar.	100	2,000,000	2,000,000	8 % S., Jan.,	20 1/2 26
b New Or. City & Lake RR..... guar.	100	2,000,000	2,000,000	4 % S., Jan.,	— —
c Orleans Railroad.....	50	500,000	185,000	1 1/2 %	52
St. Charles Street Railway.....	50	1,000,000	1,000,000	1 1/2 % Oct.,	56 1/2 57
New York—Mar 18:					
Central Crosstown RR.....	100	600,000	600,000	2 1/2 % Q.	255 300
c Christopher & 10th Sts. RR. guar.	100	650,000	650,000	2 % Q., Oct.,	175 185
Dry Dock, E. Bldg'g & Battery RR.	100	1,200,000	1,200,000	1 1/2 % Q., Nov.	120 125
d Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000	2 1/2 % Q., Feb. 1900.	168 168 1/2
e Bleecker St. & Fulton F. Ry. guar.	100	900,000	900,000	3/4 % A., July,	85 87
f Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000	2 1/2 % Q.	282 240
g Gen. Park, N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2 1/2 % Q.	192 200
h Eighth Avenue RR.....	100	1,000,000	1,000,000	.....	390 405
i 42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	4 % Q.	392 402
j Ninth Avenue RR.....	100	800,000	800,000	.....	198 201
k Sixth Avenue RR.....	100	2,000,000	2,000,000	.....	205 225
l Twenty-third St. R. R. Co. guar.	100	600,000	600,000	4 % Q.	400 410
m Second Avenue RR.....	100	2,500,000	1,862,000	2 % Q., Jan.	198 201
n Third Avenue RR.....	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.	121 121 1/2
o 42d St. Manhattan & St. Nich. Av	100	2,500,000	2,500,000	.....	65 75
* Union (Huck)berry Ry.....	100	2,000,000	2,000,000	.....	190 200
Newark N. J.—Mar 18					
Consolidated Traction Co. of N. J....	100	15,000,000	15,000,000	.....	62 62 1/2
North Jersey Railway Co.....	100	6,000,000	6,000,000	.....	24 1/2 25
United Elec. Co. of New Jersey..	100	504,000	504,000	1 1/2 % A.	22 24
Pittsburg, Pa.—Mar 18					
Allegheny Traction Co.....	50	500,000	500,000	.....	27 28
o Consolidated Traction Co..... com.	50	15,000,000	15,000,000	2 % Jan.	25 1/2 26
Consolidated Traction Co..... pfd.	50	9,478,850	.....	8 % Nov.	65 66
p Central Traction Co.....	50	1,500,000	.....	1 1/2 % Nov.	72 1/2 73
q Citizens' Traction Co.....	50	8,000,000	.....	6 % A.	72 1/2 72 1/2
r Duquesne Traction Co.....	50	8,000,000	.....	6 % A.	— —
s Pittsburg Traction Co.....	50	2,500,000	.....	8 % Nov.	— —
t Federal St. & Pleasant Valley Ry..	25	1,400,000	.....	2 %	27 29
u Pgh., Allegheny & Man. Trac. Co....	50	8,000,000	.....	2 % Aug.	— —
v Pittsburg & Birmingham Trac. Ry..	25	1,500,000	.....	1 % Oct.	41 42 1/2
w Pittsburg & West End Ry.....	50	8,000,000	.....	5 % A., June	— —
x United Traction Co..... com.	50	17,000,000	.....	J. & J.	15 15 1/2
United Traction Co..... pfd	50	8,000,000	.....	J. & J.	50 1/2 51

* Unlisted. † Ex div.
a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U R & E Co has been issued in the form of income bonds.
b Leased to Boston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
g Owned by Atlantic Ave. RR. and leased to Nassau system.
h \$30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; \$200,000 of stock owned by North Chicago Street Railroad Company.
i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
j 85 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,000 of stock owned by West Chicago Street Railroad Company.
k Majority of stock owned by Chicago West Division Railway Company; 5 % on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex div.
a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.
d Operating the former Met. Trac. system, the corporation having become extinct.
e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavyonia Ferry—now Metropolitan Street Railway.
g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1895, at \$215,000 per annum.
i Leased to Metropolitan Street Railway for 18 % on stock.
j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.
k Leased to Metropolitan Street Railway for \$145,000 per annum.
l Leased to Metropolitan Street Railway for 18 % on capital stock.
m Controlled by Third Avenue Railroad by purchase.
n Dividends of 1 1/2 % yearly guaranteed by Consolidated Traction Company.
o Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.
p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
q Leased to Fort Pitt Traction Company for 6 % on \$3,000,000 capital stock.
r Leased to Consolidated Traction Company for 4 % on capital stock.
s Leased to Consolidated Traction Company for 7 % on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock.		Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital Stock.		Rate and Date of Last Div.	Bid.	Asked.
		Author'd	Issued.						Author'd	Issued.			
New Bedford Mass. —Mar 18							Boston, Mass. —Mar 18						
Union Street Railway Co.	100	\$850,000	\$850,000	2 % Feb.	160	165	American Tel & Tel Co.	100	80,000,000	28,850,000	4 1/2 % Q. Jan.	161 1/4	161 1/4
Northampton, Mass. —Mar 18							Erie Telegraph & Telephone Co.						
Northampton Street Ry.	100	800,000	225,000	4 % A., June.	170	178	New England Telephone Co.	100	10,894,800	10,804,600	1 % Q. Feb. 20, \$1.50 p. sh. Feb	183 1/2	183 1/2
Omaha, Neb. —Mar 18							New York. —Mar 18:						
Omaha Street Ry.	100	5,000,000	5,000,000	8 % A. and N.	55	65	American Telegraph & Cable Co.	100	14,000,000	14,000,000	1 1/2 % Q.	91	94
Paterson, N. J. —Mar 18							*Central & South Am. Tel. Co.						
Paterson R. Co.	100	1,250,000	1,250,000	.....	54	..	*Commercial Cable Co.	100	6,500,000	6,500,000	1 1/2 % Q.	100	108
Providence, R. I. —Mar 18							Franklin Tel. Co.						
United Traction & Electric Co.	100	4,000,000	8,000,000	3 % Oct. '98	110	111	*Erie Telegraph & Telephone Co.	100	10,000,000	10,000,000	1 1/2 % Q.	178	175
Philadelphia. —Mar 18							*Gold & Stock Tel. Co. guar. 6 %						
Fairmount Park Trans. Co.	50	2,000,000	1,770,000	2 % Dec. '98	28	24	*International Ocean Tel. Co. guar. 6 %	100	5,000,000	4,800,000	1 1/2 % Q. Feb.	116	118
Hestonville, Man. & Fairmount	50	1,966,100	1,966,100	2 1/2 % July 15, '99	47	48	Mexican Telephone Co.	100	5,000,000	4,800,000	1 1/2 % Q.	116	118
Hestonville, Man. & Fairmount	50	588,900	588,900	8 % S. July, '98	75	76	*New York & New Jersey Tel. Co.	100	2,000,000	2,000,000	2 1/2 % Q.	170	180
αFairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	8 % Feb. 1, '99	75	76	*Pacific & Atlantic Tel. Co. guar. 4 %	25	2,000,000	2,000,000	2 % S.	70	75
Union Traction Co.	50	80,000,000	29,980,450	.....	82 1/2	84	*Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1 % Q.	..	..
Electric Traction Co.	50	8,297,920	8,297,920	.....	82 1/2	84	*Sout'n & Atlantic Tel. Co. guar. 5 %	25	950,000	559,525	2 1/2 % S.	95	100
Old Citizens' Passenger Ry.	50	500,000	192,500	88 share Q.	48	451	*Commercial Union Telegraph Co.	25	500,000	500,000	8 % S., Jan., '99	115	..
Frankford & Southwark Pas. Ry.	50	1,000,000	1,875,000	14 share A.—Apr 98	48	451	Western Union Telegraph Co.	100	97,870,000	97,870,000	1 1/2 % Q. Jan. '99	88 1/2	80
Lehigh Avenue Ry. Co.	25	1,000,000	1,000,000	A. & O.	90	90 1/2	Miscellaneous. —Mar 18:						
Lombard & South Street Ry.	25	1,000,000	1,000,000	A. & O.	90	90 1/2	American Dist. Tel. (Phila.)	25	400,000	.....	1 % Q.	26	27
Second & Third Streets Ry.	25	1,000,000	1,000,000	A. & O.	90	90 1/2	Bell Teleph. Co. (of Canada)	100	8,960,000	8,564,000	2 % S.	188	..
People's Traction Co.	50	1,000,000	1,000,000	A. & O.	90	90 1/2	Chesapeake & Potomac Tel. Co.	100	8,960,000	8,564,000	2 % S.	188	..
Germantown Passenger Ry.	50	1,000,000	1,000,000	A. & O.	90	90 1/2	Chicago Telephone Co.	100	8,960,000	8,564,000	2 % S.	188	..
Green & Coates Passenger Ry.	50	1,000,000	1,000,000	A. & O.	90	90 1/2	Central Dist. Prtg. & Tel. Co. (Phg.)	100	8,960,000	8,564,000	2 % S.	188	..
People's Passenger Ry. com.	25	1,000,000	1,000,000	A. & O.	90	90 1/2	Empire & Bay States Telegraph Co.	100	8,960,000	8,564,000	2 % S.	188	..
People's Passenger Ry. pfd.	25	1,000,000	1,000,000	A. & O.	90	90 1/2	Hudson River Telephone Co.	109	750,000	750,000	.....	148	150
Philadelphia Traction Co.	50	1,000,000	1,000,000	A. & O.	90	90 1/2	*Northwestern Telegraph Co. guar.	50	2,500,000	2,500,000	2 1/2 % Q.	124	125
Catherine & Bainbridge St.	50	1,000,000	1,000,000	A. & O.	90	90 1/2	Providence (R. I.) Teleph. Co.	50	2,500,000	2,500,000	2 1/2 % Q.	124	125
Continental Pass. Ry. guar.	50	1,000,000	1,000,000	A. & O.	90	90 1/2	Southern New Eng. Teleph. Co.	100	8,000,000	8,000,000	.....	124	125
Empire Passenger Ry. Co.	50	1,000,000	1,000,000	A. & O.	90	90 1/2	ELECTRIC LIGHT AND ELECTRICAL MFG. CO.						
Philadelphia City Pass. Ry.	50	1,000,000	1,000,000	A. & O.	90	90 1/2	Boston, Mass. —Mar 18						
Philadelphia & Gray's Ry. R.R.	50	1,000,000	1,000,000	A. & O.	90	90 1/2	Fort Wayne Electric trust receipts	100	.....	.....	.....	118	125
Ridge Avenue Passenger Ry.	50	1,000,000	1,000,000	A. & O.	90	90 1/2	Flt. Wayne Elec. Co. T. Sec. Series A.	25	.....	.....	.....	18	25
Philadelphia & Dart. Ry. guar.	50	1,000,000	1,000,000	A. & O.	90	90 1/2	*General Electric Co. [old] com.	100	40,000,000	30,460,000	2 % Q. Aug., 1898	216	216 1/2
17th & 19th Sts. Pass. Ry. guar.	50	1,000,000	1,000,000	A. & O.	90	90 1/2	General Electric Co. [new] com.	100	18,276,000	18,276,000	1 1/2 % Q. Apr., 1900	216	216 1/2
Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	1,000,000	A. & O.	90	90 1/2	T. H. Elec. Co. T. Secur., Series C	100	18,276,000	18,276,000	1 1/2 % Q. Apr., 1900	216	216 1/2
Union Passenger Ry. Co.	50	1,000,000	1,000,000	A. & O.	90	90 1/2	Westinghouse Elec. & Mfg. Co. com.	50	4,000,000	3,996,058	1 1/2 % Q. Jan.,	89 1/2	89 1/2
West Philadelphia Pass. Ry.	50	1,000,000	1,000,000	A. & O.	90	90 1/2	Westinghouse El. & Mfg. Co. pfd.	50	4,000,000	3,996,058	1 1/2 % Q. Jan.,	89 1/2	89 1/2
Rochester, N. Y. —Mar 18							Westinghouse El. & Mfg. Co. assent.						
Rochester Railway Co.	100	5,000,000	5,000,000	.....	20	23	.....	50	11,000,000	8,195,125	.....	44 1/2	45
Reading, Pa. —Mar 18							New York. —Mar 18						
Reading Traction Co.	100	1,000,000	1,000,000	Semi-an. Jan. & Jy	24	26	Edison Elec. Ill'g Co., New York	100	9,188,000	9,188,000	1 % Q. Oct. '98	119	120
City Passenger Ry.	50	850,000	850,000	Jan., '98	188	70	*Edison Elec. Ill'g Co., Brooklyn	100	4,000,000	4,000,000	1 % Q. Oct. '98	119	120
East Reading Electric Ry.	50	1,000,000	1,000,000	Jan., '98	188	70	Edison Ore. Milling Co.	100	4,000,000	4,000,000	1 % Q. Oct. '98	119	120
St. Louis Mo. —Mar 18							Electric Vehicle Co.						
Fourth Street & Arsenal Ry.	50	800,000	150,000	.....	..	..	General Electric Co. [old] com.	100	40,000,000	30,460,000	2 % Q. Aug., 1898	216	216 1/2
Jefferson Avenue Ry. Co.	50	400,000	400,000	.....	..	..	General Electric Co. [new] com.	100	18,276,000	18,276,000	1 1/2 % Q. Apr., 1900	216	216 1/2
Lindell Ry.	100	2,500,000	2,400,000	2 % Dec., 1888	..	..	Interior Conduit & Insulation Co.	100	1,000,000	1,000,000	.....	41	41
National Railway Co.	100	2,500,000	2,400,000	1 1/2 % Jan. '99	..	..	Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Cass Avenue & Fair Grounds	100	2,500,000	2,400,000	1 1/2 % Jan. '99	..	..	Pittsburg, Pa. —Mar 18						
Old Citizens' RR.	100	2,000,000	1,500,000	4 % Oct. '98	..	..	Allegheny County Light Co.	100	500,000	500,000	J. & J. Q.	168	172
St. Louis RR.	100	2,000,000	2,000,000	4 % Oct. '98	..	..	East End Electric Light Co.	50	800,000	800,000	J. & J. Q.	168	172
Missouri RR.	100	2,000,000	2,000,000	4 % Oct. '98	..	..	Philadelphia, Pa. —Mar 18						
People's RR. Co.	50	1,000,000	800,000	50c. Dec. '89	25 1/2	25 1/2	Edison Electric Light Co.	100	2,000,000	2,000,000	.....	144	144 1/2
United Electric Ry.	50	1,000,000	800,000	50c. Dec. '89	25 1/2	25 1/2	*Electric Storage Battery Co. com.	100	8,500,000	8,500,000	.....	78	77
United Electric Ry. 5 % pref.	100	1,000,000	1,000,000	3 % Jan. '99	68	65	*Electric Storage Battery Co. pfd.	100	5,000,000	5,000,000	.....	78	77
St. Louis & Suburban Ry.	100	1,000,000	1,000,000	3 % Jan. '99	95	97	Northern Elec. Light & Power Co.	10	550,000	550,000	.....	18	18 1/2
Union Depot RR.	100	4,000,000	4,000,000	8 % A., July, '99	..	..	Southern Elec. Light & Power Co.	10	187,500	187,500	.....	80	..
San Francisco, Cal. —Mar							Miscellaneous. —Mar						
California St. Cable RR.	100	1,000,000	800,000	50c. monthly.	117	119	Bridgeport (Conn.) Elec. Lt. Co.	25	800,000	800,000	.....	47	48
Geary Street Park & Ocean RR.	100	1,000,000	800,000	50c. monthly.	117	119	Missouri-Edison (St. Louis) com.	25	800,000	800,000	.....	20	21
Market Street Ry.	100	1,000,000	800,000	50c. monthly.	117	119	Eddy Electric Mfg. Co.	25	800,000	800,000	.....	9	14
Presidio & Ferries RR.	100	1,000,000	800,000	50c. monthly.	117	119	Hartford (Conn.) Elec. Light Co.	100	850,000	850,000	.....	175	176
Scranton Pa. —Mar 18							Hartford (Conn.) Lt. & Power Co.						
Scranton Railway Co.	50	6,000,000	2,500,000	.....	29	30	New Haven (Conn.) Elec. Lt. Co.	100	100,000	100,000	.....	195	..
Scranton & Carbondale Trac. Co.	100	500,000	500,000	.....	16 1/2	..	Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	1,200,000	2 % Q. Oct.	109	104
Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	.....	16 1/2	..	Rhode Island Elec. Protec. Co.	100	1,200,000	1,200,000	2 % Q. Oct.	109	104
Springfield Ill. —Mar 18							Royal Elec. Co. (Montreal)						
Springfield Consolidated Ry.	100	750,000	750,000	.....	..	..	Toronto (Canada) Elec. Light Co.	100	1,085,000	1,085,000	1 1/2 % Q.	183	183
Springfield O. —Mar 18							Thomson-Houston Welding Co.						
Springfield Street Ry.	100	1,000,000	1,000,000	.....	..	..	Woonsocket (R. I.) Electric Co.	100	1,085,000	1,085,000	8 % S. Dec. 1,	105	105
Springfield, Mass. —Mar 18							Allied Industries.						
Springfield Street Ry.	100	1,200,000	1,166,700	3 % A.	207	212	Boston Mass. —Mar 18:						
Toronto Canada. —Mar 18							American Electric Heating Co.						
Toronto Street Ry.	100	6,000,000	6,000,000	1 1/2 % S.	108 1/2	108 1/2	Street						

ELECTRICITY. BONDS.

PASSENGER RAILWAY.

NAME.	Amount.	Due	Interest periods.	Bid.	Asked.
Authorized.	Issued.				
Albany N. Y.					
Date of Quotation—Mar 18, 1901.					
The Albany Ry. Co.....Cons. mtg. 5s.	\$500,000	427,500	1940	J. & J.	117½
The Albany Ry. Co.....Gen. mtg. 5s.	750,000	575,000	1947	M. & N.	116½
Watervliet Turnpike & RR...1st mtg. 5s.	850,000	850,000	1919	M. & N.	113
Watervliet Turnpike & RR...2d mtg. 5s.	150,000	150,000	1919	M. & N.	112
Troy City Railway Co.....1st 5s	.....	.....	1942	.....	114
Interest guar. by Albany Ry. Co. Principal and interest guar. by Albany Ry. Co.					

Baltimore Md.					
Date of Quotation—Mar 18, 1901.					
United Electric Ry. Co....1st mtg. g. 4s.	\$8,000,000	18,000,000	1949	M. & S.	102
.....Income 4s.	14,600,000	.....	1949	J. & D.	74½
Baltimore City Pass. Ry. 1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	113½
Baltimore Traction Co.....1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119
Baltimore Trac. Co. Exten. & Imp. g. 5s.	1,250,000	1,250,000	1901	M. & S.	104½
Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s.	1,750,000	1,750,000	1940	J. & D.	121
Bal. Trac. Co. Coll. Trust. 1st mtg. g. 5s.	750,000	.....	1902	J. & J.	101
Baltimore Traction Co. Convertible 5s.	800,000	.....	1906	N. & M.	102½
Central Pass. Ry. Co.....1st mtg. g. 5s.	98,000	117,000	1912	J. & J.	.....
Central Pass. Ry. Co. Cons. mtg. g. 5s.	604,000	680,000	1922	M. & N.	119
City & Suburban Ry. 1st mtg. g. 5s.	8,000,000	8,000,000	1922	J. & D.	116
Lake Roland Elev. 1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117

All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.					
Date of Quotation—Mar 8, 1901.					
Lynn & Boston RR.....1st mtg. g. 5s.	5,579,000	3,702,000	1924	J. & D.	114
West End Street Ry.....Deben. g. 5s.	8,000,000	3,000,000	1902	M. & N.	104½
West End Street Ry.....Deben. g. 4½s.	2,000,000	2,000,000	1914	M. & S.	112
†\$1,674,000 in escrow to retire outstanding bonds of absorbed companies.					

Charleston S. C.					
Date of Quotation—Mar 19, 1901.					
Enterprise Street RR.....1st mtg. 5s.	500,000	47,000	1908	J. & J.	.....
Charleston City Ry.....1st mtg. 5s.	850,000	.....	.....	J. & J.	106
†Controlled by Charleston St. Ry. Co.					

Chicago Ill.					
Date of Quotation—Mar 18, 1901.					
Chicago City Ry.....1st mtg. 4½s.	6,000,000	4,619,500	1901	J. & J.	101½
Chicago Passenger Ry.....1st mtg. 5s.	400,000	400,000	1908	F. & A.	102
Chicago Passenger Ry.....Cons. mtg. 5s.	1,000,000	600,000	1929	J. & D.	.....
Chicago & So. Side R. T.....1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	.....
Chicago & So. Side R. T.....4½s.	1,500,000	750,000	1907	J. & J.	.....
Chicago West Div. Ry.....1st mtg. 4½s.	4,040,000	4,040,000	1932	J. & J.	108½
Lake Street Elevated RR.....1st mtg. g. 5s.	7,874,000	8,781,200	1928	J. & J.	.....
Metrop. W. Side Elev. Ry.....1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96
North Chicago St. RR.....1st mtg. 5s.	8,171,000	8,171,000	1906	J. & J.	106
North Chicago St. RR.....Cert. Indeb. 6s.	800,000	.....	1911	J. & J.	.....
North Chicago City Ry.....1st mtg. 5s.	800,000	800,000	1900	J. & N.	.....
North Chicago City Ry.....consol. 4½s.	2,500,000	2,500,000	1927	M. & N.	108
West Chicago St. RR.....1st mtg. 5s.	4,100,000	8,969,000	1928	M. & N.	111
West Chicago St. RR.....Deben. 6s.	700,000	700,000	1911	J. & D.	101
West Chicago St. RR.....Con. mtg. g. 5s.	12,500,000	6,000,000	1936	.....	109½
W. Chicago St. RR. Tunnel.....1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	.....
†Redeemable at option on 60 da. notice. Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee. Subject to call after Oct. 1, 1899, at \$110 and interest. Assumed by W. Chi. RR. Co., lessee. Int. guar. by W. Chicago St. RR. Co.					

Cincinnati, O.					
Date of Quotation—Mar 18, 1901.					
Cin. New & Cov. St. Ry. 1st Con. mtg. g. 5s.	8,000,000	2,500,000	1928	J. & J.	114½
†Mt. Adams & Eden Pk In. 1st mtg. 5s.	46,000	46,000	1900	A. & O.	108½
†Mt. Adams & Eden Pk In. 1st mtg. 5s.	100,000	100,000	1905	A. & O.	114
†Mt. Adams & Eden Pk Inc. Cons. mtg. 5s.	581,090	581,000	1906	M. & S.	108½
So. Cov. & Cin. St. Ry. 1st mtg. 5s.	250,000	250,000	1912	M. & S.	121½
So. Cov. & Cin. St. Ry. 2d mtg. 5s.	400,000	400,000	1932	J. & J.	122½
†Assumed by the Cincinnati St. Ry. Co. †\$250,000 reserved to retire 1st mtg. bds.					

Cleveland O.					
Date of Quotation—Mar 18, 1901.					
Brooklyn Street RR. Co.....1st mtg. 5s.	600,000	600,000	1908	M. & S.	106½
Cin. New & Cov. St. Ry. Cons. mtg. 5s.	8,000,000	2,500,000	1922	J. & J.	118½
Cleveland City Cable Ry.....1st mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105½
Cleveland Electric Ry. Co. 1st mtg. g. 5s.	8,500,000	1,249,000	1918	M. & S.	106
Columbus (O.) Cent. Ry.....1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	.....
East Cleveland RR.....1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	107½
Fl. Wayne (Ind.) Elec. Ry. 1st mtg. g. 5s.	900,000	.....	1922	M. & N.	.....
Lorain (O.) Street Ry.....1st mtg. 5s.	200,000	200,000	1915	J. & J.	.....
St. Ry. Co. Grand Rapids.....1st mtg. 5s.	600,000	600,000	1912	J. & D.	.....
†\$1,900,000 in escrow to retire bonds of absorbed companies, marked a. Interest guar. by Cons. St. Ry. Co.					

Detroit Mich.					
Date of Quotation—Mar 18, 1901.					
Detroit Citizens' St. Ry.....1st mtg. 5s.	7,000,000	8,885,000	1905	A. & O.	102½
Fl. Wayne & Belle Isle Ry.....1st mtg. 5s.	400,000	877,000	1902	A. & O.	.....
The Detroit Ry.....1st mtg. 5s.	1,800,000	1,800,000	1926	J. & D.	106
†\$1,150,000 in escrow to retire bonds of Del. City Ry. and Grand River St. Ry.					

New Haven Conn.					
Date of Quotation—Mar 18, 1901.					
New Haven St. Ry.....1st mtg. g. 5s.	600,000	600,000	1918	J. & J.	111
New Haven (Edgewood Div.) 1st mtg. 5s.	350,000	350,000	1914	J. & D.	111
Witcham Avenue RR.....1st mtg. g. 5s.	100,000	600,000	1912	M. & N.	109
Witcham Avenue RR.....Deben. g. 5	100,000	24,000	1912	M. & S.	.....

PASSENGER RAILWAY.

NAME.	Amount.	Due	Interest periods.	Bid.	Asked.
Authorized.	Issued.				
New Orleans La.					
Date of Quotation—Mar 18, 1901.					
Canal & Claiborne RR.....cons mtg. 5s.	\$150,000	\$150,000	1912	M. & N.	.....
Crescent City RR.....1st mtg. 5s.	.....	50,000	1899	M. & N.	106½
Oreosent City RR.....Cons. mtg. g. 5s.	5,000,000	8,000,000	1946	J. & J.	.....
New Orleans City RR.....1st mtg. 5s.	418,500	899,000	1908	J. & D.	108
N. Orl's City & Lake RR.....1st mtg. g. 5s.	5,000,000	2,699,500	1948	J. & J.	112
N. Orleans & Carrollton RR. 2d mtg. g. 5s.	890,000	890,000	1907	F. & A.	112
Orleans Railroad Co.....Cons. mtg. 5s.	800,000	800,000	1912	J. & J.	.....
St. Charles St. RR. Co.....1st mtg. 5s.	800,000	75,000	1906	J. & D.	.....
†\$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds. †\$90,000 outstanding.					

New York.					
Date of Quotation—Mar 18, 1901.					
Atlantic Ave. (Brooklyn).....Imp. g. 5s.	1,500,000	1,500,000	1984	J. & J.	95
Atlantic Av. (Brooklyn) 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107½
Atlantic Av. (Brooklyn).....Cons. mtg. 5s.	8,000,000	1,966,000	1981	A. & O.	110
Broadway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1948	J. & D.	116
Broadway & 7th Ave.....1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	125
Broadway & 7th Ave.....2d mtg. 5s.	500,000	500,000	1914	J. & J.	108½
Broadway Surface.....1st mtg. 5s.	1,125,000	1,125,000	1924	.....	115
Broadway Surface.....2d mtg. 5s.	1,000,000	1,000,000	1905	.....	117
Brooklyn City RR. Co. 1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116
Brooklyn City & Newtown.....1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115
Brooklyn Bath & W. E. RR. Gen. mtg. 5s.	1,000,000	448,000	1938	J. & J.	101
Brooklyn Heights RR.....1st mtg. 5s.	250,000	250,000	1941	A. & O.	104
Brooklyn, Q's Co. & Sub'n. 1st mtg. 5s.	8,500,000	8,500,000	1941	J. & J.	112
Brooklyn, Q's Co. & Sub'n. 1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107
Brooklyn Rapid Transit.....gold 5s.	7,000,000	5,181,000	1945	.....	109½
Bleecker St. & Fulton Ferry RR. 1st mtg. 7s.	700,000	700,000	1900	.....	108½
Cent Pk. N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107
Central Crostown RR.....1st mtg. 5s.	250,000	250,000	1922	M. & N.	125
Coney Island & Brooklyn RR. 1st mtg. 5s.	800,000	800,000	1908	J. & J.	101
D. Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s.	1,000,000	980,000	1932	J. & D.	117
Dry Dock, E. Bd'y & Bat'y R. scrip 5½.	100,000	1,100,000	1914	F. & A.	102
Eight Ave. RR. Co.....Cert. Indeb. 6½.	000,000	1,000,000	1914	F. & A.	108
42d St., Man. & St. Nich. Av. 1st mtg. 5s.	200,000	1,200,000	1910	M. & S.	116½
42d St., Man. & St. N. Av. 2d mtg. Inc. 5s.	1,500,000	1,500,000	1915	J. & J.	82
Lex. Ave. & Pav. Ferry RR. 1st mtg. Inc. 5s.	5,000,000	5,000,000	1938	M. & S.	124
Metropolitan St Ry Co. g. m. cl. tr. g. 5s.	12,500,000	1,500,000	1907	F. & A.	120
Second Avenue Ry. Gen. cons. mtg. 5s.	1,600,000	1,600,000	1909	M. & N.	120
Second Avenue Ry.....Deb. 5s.	800,000	800,000	1909	J. & J.	178½
Steinway Ry. (L. I.).....1st mtg. g. 5s.	1,500,000	1,500,000	1922	J. & J.	117
South Ferry RR. Co.....1st mtg. 5s.	850,000	850,000	1919	.....	110½
Third Avenue RR.....1st mtg. g. 5s.	5,000,000	5,000,000	1917	J. & J.	123½
Twenty-third Street Ry.....1st mtg. 5s.	.....	.....	1909	J. & J.	.....
Twenty-third Street Ry.....Deb. 5s.	150,000	150,000	1906	J. & J.	106
Union (Huckleberry) Ry.....1st mtg. 5s.	2,000,000	2,000,000	1942	F. & A.	118
Westchester Electric RR.....1st mtg. 5s.	500,000	600,000	1948	J. & J.	110
†\$1,085,000 in escrow to retire gen. mtg. bonds. †\$4,850,000 in escrow to retire maturing obligations. †\$552,000 in escrow to retire 1st and 2d mtg. bonds. †In treasury, \$80,000. †Guar. by Union Ry. Co.					

Toronto Canada.					
Date of Quotation—Mar 18, 1901.					
Montreal St. Ry.....1st mtg. 5s.	3,500,000	800,000	1908	M. & S.	.....
Toronto St. Ry.....1st mtg. g. 4½s.	4,550,000	2,300,000	1927	M. & S.	.....
†\$85,000 per m. single track authorized. \$600,000 in escrow to retire 5s due in 1901.					

Toronto Canads.					
<i>Date of Quotation</i> —Mar 18, 1901.					
Montreal St. Ry.....1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	.....
Toronto St. Ry.....1st mtg. c. 4½s.	4,550,000	2,200,000	1907	M & S.	.....
1885,000 per m. single track authorized.					
500,000 in escrow to retire 5s due in 1901.					
Philadelphia.					
<i>Date of Quotation</i> —Mar 18, 1901.					
Continental Pass. Ry.....1st. mtg. 5s.	850,000	810,000	1909	J. & J.	.....
Empire Pass. Ry.....1st mtg. 7s.	800,000	700,000	1900	J. & J.	.....
Greene & Coates St. Ry.....1st mtg. 5s.	100,000	100,000	1898	J. & J.	.....
Camden & So. St. Pass. Ry.....1st mtg. 5s.	150,000	.....	1901	.....	.....
People's Pass. Ry.....1st mtg. 7s.	250,000	250,000	1906	J. & J.	.....
People's Pass. Ry.....2d mtg. 5s.	500,000	458,000	1911	J. & J.	.....
People's Pass. Ry.....Cons. mtg. 5s.	1,125,000	897,000	1912	M. & S.	.....
People's Pass. Ry.....Stk. trs. cert. g. 4s.	5,698,210	.....	1948	.....	.....
Phila. City Passenger Ry.....1st mtg. 5s.	200,000	200,000	1910	J. &	.....
Philadelphia Trac. Co.....Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	.....
Thirteenth & 15th St. Ry.....1st mtg. 5s.	100,000	100,000	1908	A. & O.	.....
Union Passenger Ry.....1st mtg. 5s.	500,000	500,000	1911	A. & O.	.....
Union Traction Co.....Coll. tr. 4s.	29,735,000	29,724,876	1946	A. & O.	.....
West End Passenger Ry.....1st mtg. 7s.	.....	.....	1905	.....	.....
West Phila. Pass. Ry.....1st mtg. 5s.	250,000	245,000	1908	A. & O.	.....
West Phila. Pass. Ry.....2d mtg. 5s.	750,000	750,000	1926	M. & N.	.....
The trust certificates were issued to pay for the shares of the Electric and People's Traction Lines purchased.					

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bid.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—Mar 18 1901						
Jefferson Avenue Ry.....1st mtg. 6s.	270,000	270,000	1905	M. & N.	162	113
Lindell Ry. Co.....1st mtg. 6s.	1,500,000	1,500,000	1911	F. & A.	107	118
Missouri RR. Co.....1st mtg. 6s.	1,000,000	700,000	1916	M. & S.	105	106
†Mound City RR. Co.....1st mtg. 6s.	400,000	800,000	1910	A. & O.	104½	105½
People's RR. Co.....1st mtg. 6s.	125,000	125,000	1902	J. & D.	.....	.....
†People's RR. Co.....2d mtg. 7s.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 6s.	1,000,000	800,800	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric 1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 6s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
†St. Louis & Sub. Ry.....1st mtg. 6s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5s.	800,000	800,000	.....	.....	80	84
†Southern Electric Ry.....Cons. mtg. 6s.	500,000	500,000	1900	M. & N.	106	106
†Taylor Avenue St. Ry.....1st mtg. 6s.	500,000	500,000	1913	J. & J.	116½	117½
Union Depot RR. Co.....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.....Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	128
†Controlled by St. Louis RR. Co.						
†Controlled by Union Depot RR. Co.						
†Controlled by Lindell RR. Co.						
†\$200,000 in escrow to retire 1st & 2d mtg.						
†\$500,000 in escrow.						
†\$200,000 in escrow to retire 1st mtg. bds.						
San Francisco Cal.						
Date of Quotation—Mar 18 1901.						
California St. Cable RR.....1st mtg. 6s.	1,000,000	800,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	.....	117
Geary St., Park & Ocean RR.....1st mtg. 6s.	1,000,000	871,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. 6s.	8,000,000	8,000,000	1918	J. & J.	128½	.....
†Metropolitan Ry. Co.....1st mtg. 6s.	200,000	.....	.....	.....	.....	.....
†Omni-bus Cable Co.....1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	.....
†Park & Cliff House RR.....1st mtg. 6s.	850,000	850,000	1913	J. & J.	108½	107
†Park & Ocean RR.....1st mtg. 6s.	250,000	250,000	1914	J. & J.	115	.....
†Powell St. Ry.....1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	128
†Sutter St. Ry. Co.....1st mtg. 6s.	1,000,000	900,000	1918	M. & N.	.....	.....
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Mar 1, 1901						
Belt Ry. Co.....Cons. mtg. 6s.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 6s.	500,000	500,000	1914	A. & O.	128	.....
Washington & Soldiers' Home 1st mtg. 6s.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	.....	.....
†\$50,000 in escrow to retire 1st mtg. bds.						
Miscellaneous.						
Date of Quotation—Mar 18 1901.						
Bridgeport Traction Co.....1st mtg. 6s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 6s.	5,000,000	2,542,000	1921	F. & A.	118	.....
†Hiscox St. R. (Ind'polis) 1st cons. m. 6s.	4,000,000	2,000,000	1928	M. & N.	104	105
†Crosstown St. Ry. (Buffalo) 1st mtg. 6s.	2,000,000	2,396,000	1922	M. & N.	113	118
†Columbus (O.) St. Ry.....1st cons. g. 6s.	8,000,000	2,251,000	1922	J. & J.	115	.....
†Consolidated Traction (N. J.) 1st mtg. 6s.	15,000,000	12,945,000	1928	J. & D.	111½	111½
†Crosst'n St. Ry. (Columb.) 1st mtg. g. 6s.	2,000,000	872,000	1928	J. & D.	115	115½
†Denver City Cable Ry.....1st mtg. g. 6s.	4,000,000	8,800,000	1920	J. & J.	20	.....
†Denver Con. Tram'y Co.....Cons. m. g. 6s.	4,000,000	922,000	1928	A. & O.	80	85
†Louisville (Ky.) Ry.....1st cons. mtg. g. 6s.	6,000,000	4,281,000	1920	J. & J.	119	119½
†Minneapolis St. Ry.....1st cons. mtg. g. 6s.	5,000,000	4,080,000	1919	J. & J.	110½	110½
†No. Hudson Co. Ry. (N. J.) Cons. mtg. 6s.	8,000,000	2,878,000	1928	J. & J.	108	.....
†No. Hudson Co. Ry. (N. J.) 2d mtg. 6s.	500,000	550,000	1928	M. & N.	.....	.....
†No. Hudson Co. Ry. (N. J.) Deb. 6s.	500,000	489,000	1902	F. & A.	.....	.....
†Paterson (N. J.) Ry.....Cons. mtg. g. 6s.	1,250,000	1,000,000	1921	J. & D.	.....	.....
†Rochester (N. Y.) Ry.....1st mtg. 6s.	8,000,000	2,000,000	1920	A. & O.	.....	.....
†St. Paul City Ry.....Cons. g. 6s.	5,500,000	4,298,000	1927	.....	105½	106
†St. Paul City Ry.....Deb. g. 6s.	1,000,000	1,000,000	1900	.....	108	.....
†\$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
†\$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
†\$700,000 in escrow to retire bonds of U. St. RR. Co.						
†\$70,000 in treasury.						
†\$500,000 res'ed to redeem prior liens.						
†\$620,000 in escrow.						

*With Int' res

ELECTRIC LIGHT AND ELECTRIC MFG. CO'S

Boston, Mass.						
Date of Quotation—Mar 1 1901.						
Delaware Gas Lt. Co.....1st m. 5s. g.	800,000	800,000	.....	J. & J.	108	108
Edison Elec. Illuminating Co., Boston.....	2,026,000	.....	.....	Quar.	187	.....
General Electric Co., gold coup. deb. 5s.	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa.						
Date of Quotation—Mar 18, 1901						
Allegheny County Light Co.....6s.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Scrip 6s.	195,570	.....	.....	M. & S.	.....	.....
Miscellaneous. —(Mar 18 1901.)						
Edison El. Ilg. Co. (N. York) 1st m. 5s.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilg. Co. (N. Y.) con. m. g. 6s.	15,000,000	2,188,000	1928	.....	124	.....
Edison Elec. Ilg. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122½	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
Edison Co. El. Lt. & Pow. Co. 1st mtg. 6s.	2,500,000	.....	1927	A. & O.	100	105
Kings Co. El. Lt. & Pow. Co. pur. money 6s.	5,176,000	.....	1927	A. & O.	120	122
Milwaukee El. Ry. & Lt. Co. 1st con. g. 6s.	8,000,000	.....	.....	F. & A.	102½	.....
United Elec. Light & Power Co (N. Y.)...	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—Mar 18 1901.						
American Bell Telephone.....4s.	.....	.....	1908	F. & A.	100%	101
Northwestern Telegraph Co.....7s.	.....	.....	.....	.....	.....	.....
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 5s.	.....	.....	.....	.....	114	115
Chesapeake & Potomac Teleph. Co....5s.	.....	.....	1911	J. & D.	108	116

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—Mar 18 1901.						
American Electric Heating.....7s	500,000	500,000	.....	.....	.....	.....
Armington & Sims Engine Co.....6s.	.....	.....	.....	.....	.....	25
Barnett & Smith Car Co.....6s.	.....	.....	1942	J. & J.	106	107
Carborundum Mfg. Co.....6s.	.....	.....	1904	J. & D.	.....	.....
Worthington Pump Co.....†Nominal.	75,000	.....	.....	.....	115	127
Gallated						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16½c.; Lake, 16½@17c.; casting, 16½@16½c.

The Providence, R. I., Telephone Company has increased its capital stock from \$1,600,000 to \$2,000,000.

The Twin City Rapid Transit Company has settled its litigation with the State of Minnesota over its license fees.

Business failures in the United States last week numbered 209, against 198 the same week last year; in Canada there were 33, against 23 last year.

The United Traction & Electric Company of New Jersey has declared a dividend of 1 per cent. payable April 1. Books closed March 19 and reopen April 2.

The following are quotations for some of the industrial stocks not quoted elsewhere: Electrical Lead Reduction, 5½@5½; Electric Boat, 24@26; Electric Vehicle, 15@15½.

The N. Y. State Board of Railroad Commissioners gave a hearing March 13, on the application of the Buffalo, Niagara Falls & Rochester Railroad Company, for permission to begin an electric road connecting the cities named.

According to the Boston "News Bureau" the president of a large independent telephone company, located in the West, says that since the Berliner decision he has been able to sell bonds to the par value of \$1,500,000 for construction purposes.

Steps are being taken to secure a New York market for the securities of the Massachusetts Electric Railway Company, which controls the street railway lines in Massachusetts north and south of Boston and a few others extending into New Hampshire and Rhode Island. At present these securities are only on the Boston market.

At a cost of nearly a quarter of a million dollars, the Royal Electric Company of Montreal has purchased land to erect buildings which will enable the company to about triple its present production. The electrical power is to be developed to 30,000 horse power, of which the Montreal Street Railway will take 10,000, and for lighting 20,000 horse power. The capacity of the existing works is only about 10,000.

The directors of the Westinghouse Electric and Manufacturing Company, at their meeting on March 14, voted to issue \$3,000,000, par value, of the recently authorized increase of capital stock, the price, terms and conditions of the issue to be upon the recommendation of a special committee, determined at the regular board meeting to be held on March 27. The directors also declared the regular quarterly dividend of 1½ per cent. on the preferred stock, payable April 1. Books close March 23 and reopen April 2.

The New York & New Jersey Telephone Company offers stockholders \$1,875,000 of new stock at par on the basis of one share of new stock for each four shares held. Right to subscribe expires April 15. Payment for new stock will be 50 per cent. April 15, 25 per cent. August 1, and 25 per cent. November 1, or subscribers may pay for the entire amount April 15 at \$101 per share. None of the above stock will participate in the dividend payable April 15.

At a meeting of the directors of the Seattle Electric Company, held on March 13 in Boston, the first regular quarterly dividend of 1½ per cent. on the preferred stock was declared payable April 1 to stockholders of record, March 15. Transfer books closed March 15 and open April 2. The Seattle Electric Company was organized in January, 1900, by Messrs. Stone & Webster of Boston to take over and operate the properties of nine railroads and three light companies in the city of Seattle. Its capital stock consists of \$5,000,000 of the common stock, \$1,250,000 of preferred—all of which will be issued.

A special meeting of the stockholders of the Telephone, Telegraph & Cable Company of America will be held at the office of the company, No. 55 Montgomery street, Jersey City, N. J., on March 26, at 12 o'clock. The advisability of reducing the capital stock from \$30,000,000 to \$9,000,000 by reducing the par value of the shares from \$50 to \$15 will be considered. The proposed action by the company in reducing its capital stock to \$9,000,000 by reducing the par value to \$15 eliminates the assessment feature and leaves the company with a fully paid up capital of \$9,000,000.

Vice-President Clark, of the Western Union Telegraph Company, was the witness before the Industrial Commission in Washington last week. He argued against Government ownership of the telegraph companies. There are in the United States 1,118,086 miles of wire to 1,585,267 in all Europe. The population per mile of telegraph wire in the United States is 67 to 130 in Great Britain, 220 in Switzerland and 321 in Belgium. There are 29,000 telegraph offices in the United States to 10,816 in Great Britain. The capitalization of the Western Union Telegraph Company is \$41 per mile of wire. The capitalization in Great Britain is about twice as much. The Government of Great Britain has lost about \$22,000,000 from its ownership of telegraph lines.

Baring, Magoun & Co., offers \$2,000,000 Commercial Cable Company 4 per cent. mortgage bonds at 101 and interest. The proceeds of this issue are to be used to extend the land line, as the mortgage covers the Cable Company's property as well as the entire property of the Postal Telegraph Company. The net earnings of the company for 1900 were \$2,679,666, while the interest charge is only \$800,000. Besides which the company holds a reserve fund of nearly \$4,500,000 invested in United States Government and first-class American railway bonds. One very unique feature of these bonds is that they are exchangeable into sterling debenture stock with the same security at about 1½ per cent. under the par of exchange, thus making it a continuous call on sterling at a very attractive rate.

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EDITORIAL NOTES.

Marconi Wins His Suit.

In the issue of *ELECTRICITY* of October 11, 1899, under the title of "Who First Discovered Wireless Telegraphy?" we referred at considerable length to the fact that Prof. Dolbear proposed to bring a suit for infringement and damages against Marconi. This suit has been tried and the United States Circuit Court of New York on Friday last handed down a decision in favor of the Italian inventor. The suit was brought by Lyman C. Learned of Boston.

Mr. Learned sued as the assignee of Prof. Dolbear for damages to the amount of \$100,000, and the issue of an injunction restraining Marconi from using apparatus for wireless telegraphy, said apparatus being alleged by the plaintiff to be covered by patents issued to Dolbear.

The original complaint in the case set forth that Dolbear was the original inventor of the system, that his patents were issued in December, 1882, and October, 1886, and assigned to Learned in July, 1899. The complaint further stated that the apparatus for wireless telegraphy exhibited in the diagrams of Marconi's patents was impractical, and that the defendant well knew this. It had, the complainant alleges, only commercial value when one terminal grounded was used for transmission and one for receiving, and hence that contracts entered into by the defendant for commercial purposes were carried out by recourse to the plaintiff's patented instruments, or instruments similar. Therefore, application was made for the injunction and demand was made that Marconi be directed to pay over profits to the plaintiff. Marconi applied similar criticism to the apparatus of Dolbear. It was useless, and not adapted for any commercial purposes, his defence alleged. For the rest, he set up a general denial that his wireless telegraphy apparatus or any part of it was an infringement of the plaintiff's.

During the course of the litigation, D. J. A. Fleming, a professor of electrical engineering in University College, London, England, and Prof. Charles R. Cross Thayer, professor of physics in the Massachusetts Institute of Technology, testified as experts. The contentions of the plaintiff were held not to be sustained.

The Metric System.

It is to be regretted that Congress failed to pass House bill 5,768 to adopt the weights and measures of the metric system as the standard weights and measures in the United States. For several consecutive Congresses preceding the last one bills have been introduced looking to the adoption of the metric system, and in each Congress the proposition has received the favorable consideration of the Committee on Coinage, Weights and Measures. The obvious advantages of the system as compared with the system or systems now in use have impressed all who have given the subject serious consideration. Voluminous reports have been made from time to time, clearly setting forth the disadvantages of the highly complex systems of weights and measures now in use in the United States and the greatly superior facilities offered by the metric system.

One of the most important reasons for its adoption by the United States is that it is the international system of weights and measures. Its recent adoption by the Russian Government leaves, practically, among the civilized nations of the world, only the United States and Great Britain not using it. As these nations use measures essentially the same, it may be said that they are now backing the foot and the pound against the meter and kilogram supported by all the rest of the world. It is time that they were justified in considering themselves the two greatest nations of the world, and in trade and commerce they are not surpassed. But it must not be forgotten that their desire is to establish and maintain trade with nations using the metric system exclusively. As the people of these nations have long ago learned the superior conveniences of that system, they will not trade in any other if they can avoid it. Germany and France here have a decided advantage over England and the United States and have not been slow to improve their opportunities.

The practical sense of the Englishman is broadly awake to the fact that his obstinate adherence to a clumsy and unscientific system of measurement is one of the large factors in the relative diminution of English trade and manufacture, and he is almost sure to remedy this difficulty in the near future. What is true in England is even more true in the United States. We are only just beginning our efforts to win a fair share of the markets of the world, but many of our manufacturers

have already found it necessary to adopt metric units in the construction of electrical machinery for foreign export. At this particular time its general adoption would be of the greatest assistance to our foreign trade. Besides, we have recently brought into our fold a considerable population long accustomed to the use of the metric system, and our intercourse with them would be greatly facilitated by its adoption.

The Fifty-sixth Congress distinguished itself by providing for the establishment of a national bureau of standards—an act of the greatest importance to the electrical fraternity. May we not cherish the hope that the Fifty-seventh Congress will go a step further and legalize the metric system of weights and measures?

* * *

**Polyphase
Sub-station
Machinery.**

In view of the growing application of polyphase system of generation and transmission, combined with direct current distribution from sub-stations, to large lighting and power schemes, a paper just read before the Institution of Electrical Engineers in London by Mr. A. C. Eborall possesses interest, particularly as it is chiefly confined to practical questions of everyday working that have come within his own experience. Under the title "Some Notes on Polyphase Sub-station Machinery" Mr. Eborall first related the general ideas underlying the equipment and operation of polyphase sub-stations, subsequently giving some features of working, and a comparison of the different types of machinery that can be employed, together with details and examples taken from actual practice. High pressure transmission, and more particularly three-phase work, was the basis of the notes, which unfortunately are too lengthy to be published in full.

The conclusions which the author arrived at, assuming that it is required to convert polyphase into direct current by means of converting sub-stations, are as follows:

First—For power work, and for those cases where the amount of lighting to be done is relatively small, rotary converter sub-stations operated at 20 to 30 cycles are preferable.

Second—For lighting work the use of motor generators, operated at 40 to 50 cycles in the sub-stations, will give the best results. This is also the case when the lighting load on the sub-station forms a considerable proportion of the total output of the latter.

Third—Of the two classes of motor generator sub-station that equipped with asynchronous machinery is on the whole unsuitable for work of any magnitude.

Although in many cases direct current sub-stations are undoubtedly advisable, still in many cases the direct distribution of polyphase current from simple transformer sub-stations will undoubtedly be the best solution, not only from the technical, but also from the commercial point of view.

* * *

**The Brooklyn
Rapid Transit
Company's
New President.**

At a meeting of the directors of the Brooklyn Rapid Transit Company on March 20 Mr. Clinton L. Rossiter, who has been president of that company for six years, handed in his resignation, which was accepted, and Mr. J. L. Greatsinger was elected in his stead.

The reason for Mr. Rossiter's resignation

has not been made public, but that it is generally considered for the best interest of the property may be inferred from the fact that when the news reached Wall Street Brooklyn Rapid Transit stock rose over four points.

The new president, Mr. Greatsinger, is a practical railroad man and is at the head of the Minnesota Iron Company, which includes the Duluth Iron Range Railroad Company. His experience will no doubt suggest numerous changes in the operation of the Brooklyn Rapid Transit system that will please both the public and the employees of the company. It is even suggested that a combination between the Brooklyn Company, the Metropolitan Railroad Company and the Manhattan Railway Company may follow the election of Mr. Greatsinger. An arrangement will be made, it is said, that will enable passengers to ride direct to Coney Island for one fare and without change of cars, by connecting with the Brooklyn Rapid Transit lines at the Bridge.

Furthermore, in all probability the franchise granting the privilege of using electricity for motive power and lighting will be exercised more fully than in the past. The alliance between the Brooklyn Union Gas Company and the Kings County Electric Light & Power Company and the Brooklyn Rapid Transit system becomes complete practically with the election of a new president, and these various concerns will be operated in the future so as to reduce expenses and at the same time afford better facilities to the public.

Taking it all in all, the action of the directors at their meeting on March 20 would seem to have been a wise one, and it is sincerely to be hoped that many of the trials and tribulations that Brooklyn travelers have had to put up with will shortly be things of the past.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

ARRANGEMENTS for the annual meeting of the Superintendents of Telegraph, made up of men having charge of the telegraph lines of the various railroads, were practically completed in Buffalo at a recent meeting of the committee appointed for that purpose. The dates fixed upon were June 18, 19, 20 and 21.

In a recent interview Nikola Tesla says the success of his enterprise is more assured now than ever and that within the next six months his invention will be given a practical test. He hopes to produce the proof that it is not beyond the range of possibility to establish communication across the ocean without the aid of wires.

MR. ALBERT L. JOHNSON is busy just now promoting the Philadelphia, Trenton and Lehigh Valley Railroad Company, which is to connect New York and Philadelphia by an electric trolley line, and he has caused to be spread broadcast the following modest statement: "Before the snow falls this year my electric road will be operating between Philadelphia and New York and carrying passengers for a forty cent fare. Within a year after it is running the fare will be reduced to five cents. I have already had every foot of land between my terminus down the bay and Trenton—the point at which the route leaves New Jersey—

surveyed. We shall run that entire distance on our own private land, skirting around the edges of the towns. There will be no stop between Philadelphia and the terminus down the bay, from which boats will run to South Ferry, and the seventy-five miles will be covered in an hour and a half. The General Electric Company will guarantee a fifty mile an hour speed at a certain price for a certain weight of cars. I have calculated every item of cost, including twenty-five cents an hour for each employee's wages, and I challenge any expert to dispute my figures."

In meeting the problem of making the Milwaukee, Wis., Industrial Exposition more interesting than it has been for some time, the directors have concluded to make a feature of an electrical display this fall. The exposition will be opened September 7 and close September 28. The building will be illuminated inside and outside by thousands of electric lights. Within will be displayed electrical machinery of all sorts. The exhibit will show the hundreds of uses to which electricity is applied. During the last week the Northwestern Electrical Association will have its convention there.

ONE of the most interesting uses to which it has yet been proposed to put the automobile is in establishing a regular conveyance line from the coast of Madagascar to the inland capital, Tananarivo. The distance is one hundred and fifty miles and the route is over the new road constructed by the French Government, and is to be covered in fourteen hours, although the grade averages six per cent. A repair shop will be opened on the island, and this will probably develop into a construction factory. At first the machines will be built in France.

J. B. CHARLESON lately returned to Vancouver, B. C., from Fort Simpson, where as superintendent of Government construction of telegraphs he started ninety men to work building a line to connect Fort Simpson with the main line, now almost completed between Vancouver and Dawson. Fort Simpson is on the route of the ships returning from the Klondike, so that before the summer is out, when passing this point, they can wire their approach to the outside world or report accidents or tragedies of the sea.

THE automobile show was opened in the Coliseum at Chicago March 23 and will last a week. The exhibits are large and comprehensive and include everything from the ponderous steam truck down to the cosy little runabouts which already dot the local boulevards. There are not less than 50 electric vehicles on the floor, hailing all the way from New England to St. Louis.

AN important stage in the progress of the construction of the new Government printing office at Washington, D. C., has been reached. The building will probably be ready to be occupied by the public printer about June 1, 1902, and it will then be the most complete and by far the largest workshop of the kind in the world. The estimate for the building is \$2,429,000 and expenditures up to the present time indicate that the cost will be within that amount. The most liberal use will be made of electricity to ventilate, cool and light the building, as well as to supply all the power.

Electric fans will be used to promote ventilation and there will be 7,000 incandescent electric lights and twelve electric elevators.

THE President on Monday appointed Frederick L. Allen of Auburn, N. Y., as Commissioner of Patents, to succeed Commissioner C. H. Duell, resigned. Mr. Allen is a director of the Empire Telephone Company of Auburn, and was at one time counsel for the Bell Telephone Company in patent litigation.

MARKED progress in electrical development is being made in India. It has recently been stated that the workshops of the East Indian Railway and of the Bengal-Nagpore Railway will shortly be driven by electricity. The old and time-honored arrangement of shafting, belts and pulleys is now, in fact, giving place to electric motors. But perhaps the greatest novelty of all is the new electric lift in the Government House. When using the lift one first presses a button, which brings the lift from whatever floor it has been left to that on which it is required. One enters the lift and finds a row of push-buttons, like electric-bell pushes, each one marked for a floor at which the lift may be wanted to stop. A button is pressed, and the electric current does the rest. In order to insure safety in working, the lift will not move until all the lift doors are shut. In a lift of this sort no attendant is required. While electricity from the supply company's mains thus elevates the Viceroy, it also lifts tea at the tea warehouse, works tea-packers, and drives many printing-presses throughout Calcutta. It is also used for working sewing-machines, and will shortly blow the cathedral organ.

CONSUL NELSON, at Bergen, Sweden, in a report to the State Department, says that a successful attempt has been made to produce steel by electricity in that country. Experiments are being carried on in a factory there, and already about 25,000 pounds have been produced, in six drafts daily. This steel is said to be of an excellent quality, and meets with ready sale at high prices. On account of the cheap method of production, the profits are declared to be large.

In regard to the *Conversazione*, to be held by the American Institute of Electrical Engineers on the evening of April 12 at Columbia University, we are requested to notify those who propose to exhibit that the current available at the University is as follows: 115, 220, 440 and 500 volts, direct current; 115 volts, two-phase, 60 cycle, alternating current; 115 volts, single-phase, 130 cycle, alternating current. All exhibits must be ready at the University on Saturday, April 6, and should be marked "*Conversazione*," care Prof. F. B. Crocker, Engineering Building, Columbia University, New York City."

An interesting review of the progress made during the past five or six years in the construction of electric cranes is contributed by Alfred Kolben to the "*Elektrotechnische Zeitschrift*." He points out, says the London "*Electrical Engineer*," how it was first sought to adapt the electromotor to the peculiarities of early types of transmission gears, the single motor crane marking the period of transition from the old system to the new. But this practice did not always yield satisfactory

results. Sometimes the rope pulleys of old cranes were substituted by belt pulleys driven by electromotors, after the winding gears, square shafts and auxiliary apparatus previously in use had become worn out and consequently unserviceable. But manufacturers at first showed little disposition to discard designs which had been evolved from much thought and experience; hence it was only natural that the most clumsy and dispensable portion of the early type of overhead traveler—i.e., the rope transmission—should be the first to concede its place to the electromotor. Gradually, however, manufacturers began to adapt their designs to the conditions of electric driving, and to-day there is no doubt but that the epoch of the single-motor crane is near its end. A decided majority of modern cranes are so constructed that each of the principal movements is accomplished by a special motor.

THE manufacture of carbon for use in electric lighting and for other purposes has grown to be a great industry in the West Virginia gas belt. The processes require great heat and the expenditures of large quantities of fuel, though the plant required for putting the carbon through the preliminary processes which consume the fuel is neither expensive nor complicated. Within the past six months thousands of acres of land, in territory proven to be largely productive of gas, has been bought or leased for the gas privileges.

FIRE CHIEF CROKER has requested Corporation Counsel Whalen to take immediate steps against the Rapid Transit Subway Construction Company of this city for the purpose of making repairs to Fire Department underground property between 62d and 125th streets in Broadway. It seems that the blasting done by the tunnel workmen has seriously damaged many of the conduits carrying the wires of the Fire Department, besides rendering the wires useless for fire alarm purposes. Nothing unusually serious has resulted as yet from the breaking of the Fire Department wires, but Chief Croker has given the contractors formal notice that the city will hold them strictly responsible for any damage. In view of the certainty that the contractors are going to rush their work as soon as the frost is out of the ground the officials took the precaution to protect the city's property.

THROUGH the courtesy of the New York Electric Vehicle Transportation Company, the New York Electrical Society will hold its 213th meeting at the new Main Station, Eighth avenue and 49th street, Wednesday (to-night), March 27, at 8 o'clock. Mr. G. Herbert Condict, consulting engineer of the company and of the Electric Vehicle Company, will deliver a brief address on "Automobiles in New York City." After the address visitors will be conducted through the station, which is by far the largest of its kind in the world, and having just been completed, represents the furthest reach in the automobile art at the present moment. The method of generating the current, charging the batteries, inserting and removing batteries from the vehicles, the inspection and dispatch of vehicles, and the whole routine of the vast system of handling daily hundreds of electric automobiles, will be illustrated in full operation.

It is rumored that the General Electric Company is considering the purchase of the Harmony Mills situated in Cohoes, N. Y., and the water power which is controlled by the Cohoes Company. The General Electric Company, it is said, should the purchase be concluded, intends to abandon the canals which are in use by the Harmony Mills and use electricity instead. The Harmony Mills consist of six large buildings, being numbered among the largest mills of the kind in the world and employing several thousand operatives. It is stated that the price for the property is between \$35,000,000 and \$40,000,000.

THE captain of the Ostend mail steamer *Princess Clementine*, which is fitted with wireless telegraph apparatus, reports, says the London "*Electrician*," that when on the voyage from Dover to Ostend the French lightship, stationed 25 miles off Dunkirk to mark some dangerous sand banks, signaled the mail boat. It was then learned that the lighting apparatus was out of order, and the lightship would be unable to show a light that night unless assistance was promptly sent. The mail boat at once dispatched a wireless message to La Panne, whence a telegram was sent to Dunkirk, and in a short time a tug was sent out to the lightship to effect the necessary repairs.

W. P. ATWELL, American Consul at Roubaix, France, writes to the State Department as follows: "Dr. Dussaud, of the Psychological Institute at Paris, gave a lecture on February 16 at the *Hospital des Sociétés Savantes* on the education of the blind and deaf. A large audience witnessed interesting experiments founded on his method for supplementing the senses of these two classes of unfortunates. The cinematograph for the blind is a machine which passes under the fingers of the blind, a series of reliefs representing the same object in different positions—the branch of a tree, a bird, or any other object. Dr. Dussaud has also arranged an electric vibration for the use of the deaf who are incurable. This gives them the motion of musical rhythm. For those who are not entirely deaf he has invented a 'gradual amplifier of sounds,' which supplements the organs of hearing and in some instances improves them.

THE switch lamps in the yards of the Atchafson, Topeka & Santa Fe Railway, at Ft. Madison, Ia., are, according to the "*Railway and Engineering Review*," lighted by incandescent electric lamps by means of a circuit entering the top of the lamp through a pipe which stands vertically about 2 feet clear of the stand and arches over to bring the wires above the top of the lamp. The wiring is brought to the arched pipe by means of an underground circuit. Some trouble has been experienced with this method of bringing the circuit to the lamp, as the switchmen, in throwing the switch, take hold of the pipe with one hand and the lever of the switch stand with the other, with the result that these pipes have frequently been pulled over and the circuit broken, the lamp socket short-circuited, or the filaments broken by the jar. Arrangements are now being made to change this method of leading the circuit to the lamp. By the new plan the circuit will be run up the switch stand and enter the lamp casing from below.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 20.

THE TELEPHONE AND TELEPHONE PRACTICE.

Probably no branch of the electrical science has so rapidly advanced in its use and proportions as telephony. Since its first introduction practically no improvement or development has been made in the actual design, or principle of operation, of the telephone itself. As an example of this it may be observed that the telephone receiver that was first commercially used is practically the same as the one used to-day, and no marked improvement or change of design has been developed. However this is not so with the apparatus and circuits required in the development of the industry, for there is no question but that modern telephone engineering presents the most complicated and intricate branch of the electrical science.

The ordinary telephone receiver is one of the most sensitive of electrical instruments, and as an illustration of this it might be stated that one-millionth of the amount of electrical energy expended in the ordinary incandescent lamp would be sufficient if applied to a receiver to produce a distinct and audible sound. Consequently in the practice of telephone engineering, especially in large cities, it can be readily seen what disturbing conditions and emergencies must be contended with and how perfect in insulation and inductive relation lines and circuits must be made and maintained.

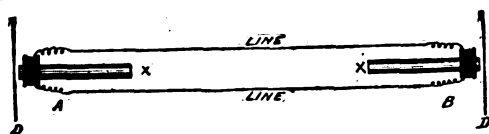


FIG. 1.

The first telephone depending on the operation of electric waves was invented by Alexander Graham Bell about twenty five years ago and was exhibited by him at the Centennial Exhibition at Philadelphia.

The original practical apparatus exhibited by Prof. Bell consisted of an instrument the same as the ear piece or receiver now used on all telephones.

I will not dwell on the shape and construction of a receiver, for that is familiar to all, but rather on the principle involved in its operation.

By connecting two of these receivers, one on each end of a line, as in Fig. 1, corresponding sound vibrations could be produced at one end, to those acting upon the other. Suppose A B to represent two receivers connected in a line and X X the permanent bar magnets with the coil, or spool, of insulated wire on the ends closest to the iron diaphragms D D. Of course a field of magnetic force will surround the bar magnet and most of these lines will pass through the coil of wire and diaphragm in their path to the opposite pole. If sound vibrations, for instance, produced by the voice, strike the diaphragm they will set it in motion, vibrating in unison with the sound waves. The effect of this iron vibrating close to the end of the magnet is to effect the lines of force, for as it approaches the magnet the lines of force

which enter it increase considerably, and as it moves away decrease in proportion. In this manner the distribution of the lines of force about the end of the magnet is changing continually with the vibrations of the diaphragm, and consequently the number of lines of force passing through the coil of wire on the magnet will be correspondingly increased and decreased. It is known to be a fact, by experiment that when a change occurs in the lines of force acting on a coil electrical action is set up in the coil. The electrical pressure being in

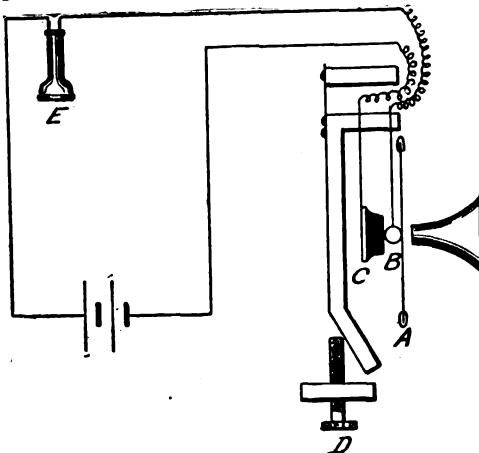


FIG. 2.

one direction when the lines of force are increased, and in opposite direction when the lines of force are decreased. Consequently a rapid succession of alternating current waves will be set up in the coil and line to which it is attached. These current waves will correspond exactly in frequency with the vibrations of the diaphragm which is causing their action. Now, as in Fig. 1, if two of these instruments be connected on a line and the diaphragm of one is set in motion by the voice, then the electric waves produced by its action will travel over the circuit, acting on the coil of the other instrument, and will set in motion the lines of force which pass through it and are attracting the iron diaphragm on it. The effect produced by the current waves on these lines of force will be the same as the effect produced at the other end by the diaphragm, so that the second diaphragm will be caused to vibrate by magnetic changes at just the same rate as the one at the other end, and in fact in unison with

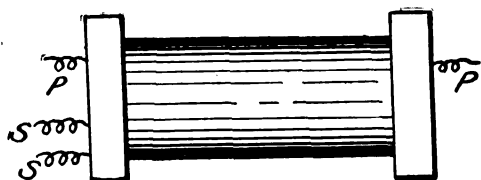


FIG. 3.

it, so that a similar sound will be given out by one diaphragm to that acting upon the other.

Although this makes an extremely sensitive and very satisfactory receiver, yet it is not sufficiently powerful as a transmitter for commercial use. The transmitters that are now generally used involve an entirely different principle, and when used in connection with the apparatus just described, as a receiver, give us the telephone complete as we know it to-day. The principle of the transmitter is to cause an increase and decrease in the rate of flow of an established current by means of sound vibrations. This involves a variation in the resistance of a circuit by the action of a diaphragm, set in vibration by sound waves, acting upon a certain part of a circuit over which

a current is flowing, to cause a continually changing resistance in the circuit, thereby increasing and decreasing the amount of current flowing. This can be more fully explained by

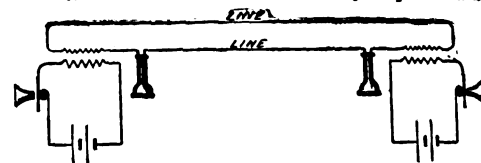


FIG. 4.

giving a description of a Blake transmitter, which was about the first invented to become commercially used. Fig. 2 is a diagram of such a transmitter and consists of a diaphragm A, a small platinum ball B attached to a fine german silver spring and a smooth polished carbon block, C, attached to a steel spring much heavier than the other one. The carbon block rests lightly against the platinum tip which in turn rests against the iron diaphragm. The tension of the spring attached to the carbon may be adjusted by the screw D.

If the diaphragm of the Blake transmitter is set in motion by sound waves it will cause the platinum tip to press more or less lightly on the carbon surface, thus varying the resistance of the contact. As this contact comprises part of a circuit over which a current is flowing, as described in the figure, the varying resistance will throw the current into waves which will correspond with the vibrations of the diaphragm. Now if a receiver E be connected in the circuit, the current passing through its coil will increase and decrease the strength of

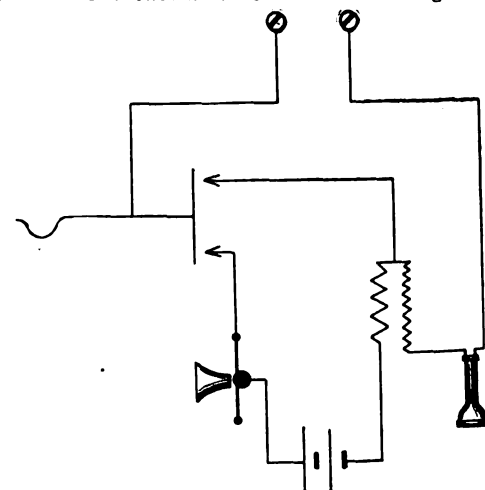


FIG. 5.

the magnet and its diaphragm will be set in motion, giving out sound corresponding with that acting on the transmitter diaphragm as already explained.

This style of transmitter is seldom if ever used except with an induction coil, Fig. 3. This consists of two windings, termed a primary and secondary wound on a core of soft iron wire. The primary is usually a few layers of comparatively heavy wire while the secondary may consist of many turns of fine wire. The induction coil is used to intensify the effect of the transmitter by connecting the primary winding in circuit with the transmitter and battery and the secondary winding in the line with the receiver. This makes it possible to talk long distances, as the current waves will be much more intense in the secondary governed by the inductive relation which the secondary bears to the primary. This can be readily understood by referring to previous articles on induction.

Fig. 4 describes a telephone circuit com-

plete where induction coils are used and also shows the place each part of the telephone occupies in a circuit.

The commercial telephone of course must be provided with means for opening and closing the battery circuit and also the line. This is done by the use of an automatic hook operated by the weight of the receiver. Fig. 5 gives the complete circuit of what is known as an ordinary local battery telephone.

Article No. 21 will be entitled "The Telephone and Telephone Practice" (continued).

LONDON NOTES.

(From our London Correspondent.)

English Electricity Works and Coal Supply.

The yearly reports of the various London and provincial electricity supply companies are now appearing. Every one of such undertakings has been somewhat severely tried by the high price of fuel and materials during the year 1900. In some cases the profits and dividends have been reduced as compared with the previous year, and this coal question is given as the cause; in others, where larger profits were anticipated than in preceding years, this has not been realized. In fact instead of there being apparent a desire to still further reduce the charges for electrical energy, the feeling is in some places favorable to an increase. Of course, it goes without saying that in nearly every place the lamp connections, and the consumption of energy are rapidly increasing, and everywhere more machinery is being put down. The general tenor of the reports is that the price of coal is now down, and will go lower, so that electricity works will be enabled to enter into better contracts. Very much the same remarks apply to the reports also being issued by municipal authorities. There is not likely to be a general cry of large net profits, as has occurred sometimes, for in addition to the higher expenditure upon fuel, there has to be taken into account the fact that many towns are adopting the policy of keeping the price per unit low, and increasing the demands still further, rather than having a surplus to hand over to the reduction of the general public rates.

Electrical Work at the Glasgow Exhibition.

English electrical engineering firms are making great efforts to be adequately represented at this international exhibition, which opens in May for about six months, and things begin to look like a great success. The English manufacturer has not done much exhibiting of electrical machinery since the Crystal Palace Exhibition of 1891. He did not put in anything like a representative appearance at Paris last year. These two facts have probably urged him to make an effort at Glasgow. Americans will doubtless be so taken up with their great Pan-American Exposition that they will devote little attention to Glasgow, but it may be remarked that anyone who is anxious to see what English and Scotch electrical engineering practice is will find it in evidence at Glasgow. Glasgow, in addition, is to be the great meeting place of all the scientific and engineering institutions this year, on account of the exhibition. There will be an International Engineering Congress from September 3 to 6 and in this all our great engineering bodies will take part. There will be eleven sections, one being devoted to electricity. This department will be conducted by

the Institution of Electrical Engineers, with Prof. John Perry as its president. The British Association opens its congress a week later. The Municipal Electrical Engineers hold their week's convention in the same city at the end of June. The large new municipal electricity works is completed, and the extensive electric tram system with its multiphase power station is to be inaugurated during the coming summer.

AN AUTOMATIC EARTHING DEVICE FOR TROLLEY WIRES.

Having regard to the fatal accident which recently occurred in Liverpool, says the "Electrical Engineer," London, we would call attention to an article by Mr. R. Ulbricht which appeared in the "Elektrotechnische Zeitschrift" for May 7, 1896. An arrangement is described therein for guarding against accidents due to the falling of telephone or other wires across trolley lines. It is based on the principle of a momentary connection between the trolley wire and earth, causing a direct connection between the same, which remains until the apparatus is reset by one of the tramway officials. The efficiency of the system is largely dependent on the employment of an automatic earthing device of very simple construction, which may serve to protect simul-

The automatic earthing device, although of only temporary construction, worked without a hitch. At each fall of the telephone wire across the guards the voltmeter immediately registered zero. The protection afforded was so complete that when a fuse of only eight ohms resistance for a maximum current of one-third of an ampere was inserted in the falling wire, it did not melt. In the last test the falling wire fused the guard wires, which had been previously weakened in many places by partial fusion, but the momentary contact had sufficed to establish a dead earth connection on the trolley wire.

An additional advantage claimed for the automatic earthing device is that it enables the guard wires to be of relatively small diameter, since they have to carry but a momentary current, and by suitable arrangement may be made to do their duty even should a large fall of telephone wires cause them to break. Further, the automatic device may be tested daily as to its condition in a similar manner to that in which automatic cut-outs are tested.

SINGLE-PHASE ALTERNATING PLANT AT FRANKFURT-AM-MAIN.

BY FRANK C. PERKINS.

The Central Station at Frankfurt-Am-Main,

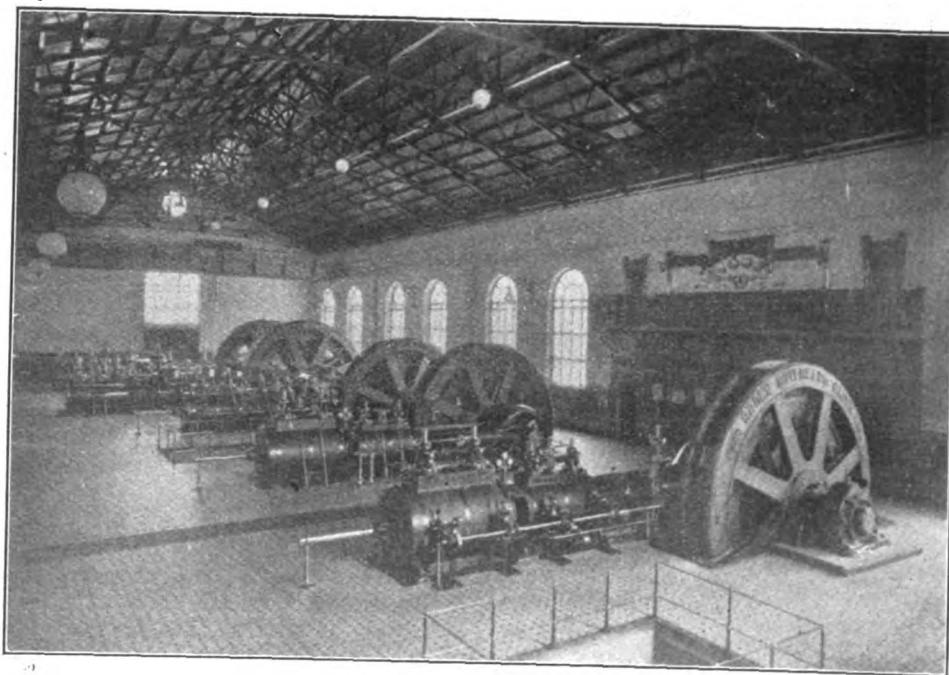


FIG. 1.—ENGINE AND GENERATOR ROOM AT FRANKFURT-AM-MAIN.

taneously several points crossed by telephone or other wires. Momentary contact between a telephone wire, the trolley line, and one of the earthed guard wires is sufficient to complete the earth connection. This causes the automatic cut-out provided in the generating station for the protection of the line to act, while the short-circuit indicator will continue to indicate the disturbance until the earthing device in the proximity of the trouble has been reset.

The arrangement has been largely adopted and was subjected to a severe test in Leipzig, where the falling wire was on the one side connected with the apparatus to be exposed to danger and on the other direct with the rails. Between the trolley wire and earth a voltmeter was inserted to enable the degree of security afforded the street traffic to be gauged.

Germany, is a single-phase alternating current plant and has a total capacity of about 10,000 hp. The accompanying illustration, Fig. 1, shows the interior of the engine and generator room, while Fig. 2 illustrates the armature wheel of one of the large 1,500 hp., single-phase alternators built by the firm of Brown, Boveri & Cie of Baden, for this power house. This installation is designed for both a lighting central station and also a power transmission plant.

The station is equipped with four units of 750 hp. and four units of 1,500 hp. These generators are of the single-phase type supplying a current of a potential of 3,000 volts, each being directly coupled to a horizontal tandem compound condensing engine, as shown in the illustration. Each alternator is supplied with a direct current exciter mounted on the end of

the alternator and engine shaft outside of the main bearing. Besides the lighting load, which amounts to more than 5,000 hp., there is a power distribution of about 4,000 hp. The motors used on the power transmission circuit are single-phase machines and vary in size from 1-10 hp. to 150 hp.

The converter station for the Frankfurt Tramways has a total capacity of 4,700 hp. The equipment consists of three motor generators, the motors of which have a capacity of 750 hp. each, and one motorgenerator of 90 hp. capacity, all of which are made up of high tension synchronous motors of the single-phase type directly coupled to continuous current dynamos. The motors operate at a potential of 2,850 volts, and the motor generators transform the alternating to a direct current for

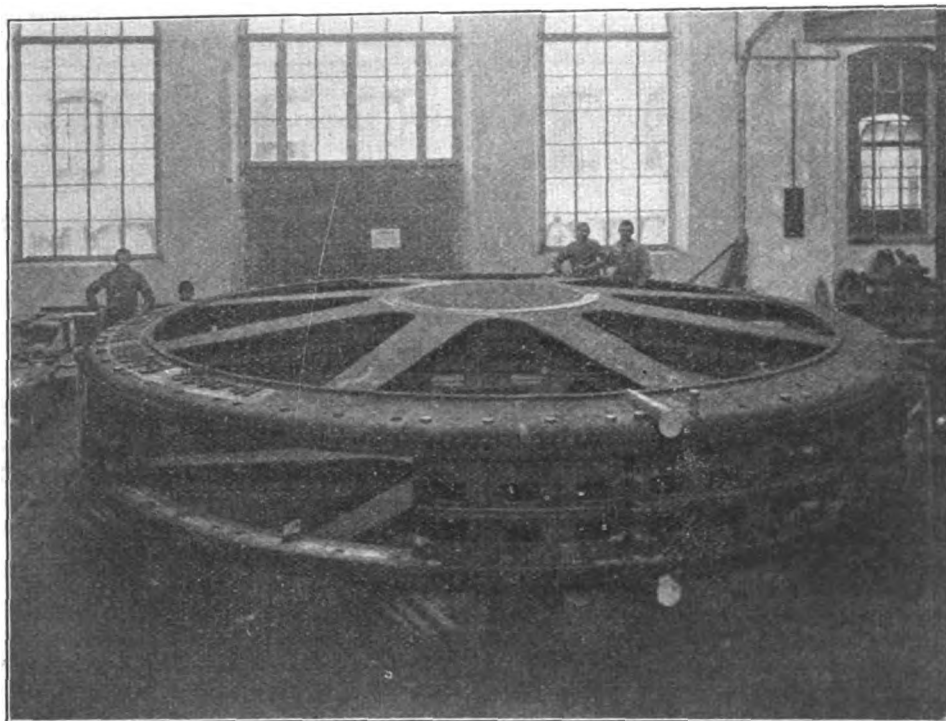


FIG. 2.—ARMATURE WHEEL OF 1,500 HP. SINGLE PHASE ALTERNATOR AT FRANKFURT-AM-MAIN.

use on the tramway feeder circuits. The generators are multipolar machines of the six pole type and supply a continuous current of 550 volts. Among the other large central station plants installed by Brown, Boveri & Cie of the single-phase type of generators is the Elberfeld Municipal Electricity Supply Works. This plant is supplied with generators of a total capacity of 3,500 hp., consisting of three units, one of which is a direct-connected single-phase alternator operated by a 1,500 hp. horizontal compound condensing engine, and the other two single-phase machines of the Brown, Boveri type, driven directly by two engines of 1,000 hp. each. This plant supplies current for both lighting and power distribution.

Electric Railways.

Major Phillip Cardew is delivering a series of three lectures at the Society of Arts in London. The first lecture, delivered on March 11, covered generally the application of electricity to underground lines, and the advisability of its use for long-distance lines. The latter, he said, was a question of expediency and cost. He did not doubt but that a 120 miles an hour speed could be accomplished, but whether it would pay to provide such a service within the limits of the British Isles.

A NEW OSCILLATOR FOR STATIONARY ELECTRICAL WAVES.*

BY DR. BERNOUILLI.

Since the researches of Hertz,[†] who first succeeded in measuring the length of electrical waves, numerous experimenters have striven to improve upon his methods, and especial attention has been given to the production of oscillations of shorter wave length. As is well known, Hertz, in his experiments, used two large oscillator plates to each of which was attached a wire terminating in a metal ball. The terminals of an induction coil were connected to the plates, and the latter were so placed that the oscillatory discharge of the coil could take place across a spark-gap left between the balls. Opposite one of these

then stretched out parallel to one another. Suppose now that with this arrangement one of the oscillator plates is charged with positive electricity; the condenser plate opposite immediately becomes negatively electrified by induction, and positive electricity is repelled from it through the wire. At the same time the other oscillator plate is negatively charged and induces positive electricity in the condenser plate opposite it, repelling negative electricity into the second wire. The result of this is that, as the induction coil is operated, points on the wire opposite one another always possess charges opposite in sign. In case the wires are bridged over by a metallic conductor, then the potential at the middle of the same must be zero, since the advancing potential functions on both sides of the middle are equal and opposite in sign—the potential wave has then a node at this point.

As in the case of a vibrating cord, so with the oscillator, waves of different length are sent out (the fundamental and its overtones). To prevent mutual disturbances it is necessary to isolate some one of these waves. To do this it is only necessary to so adjust two bridges placed on parallel wires that the distance between them is equal to some multiple of a half-wave length of that particular oscillation period. Waves of other periodicity are then destroyed by interference.

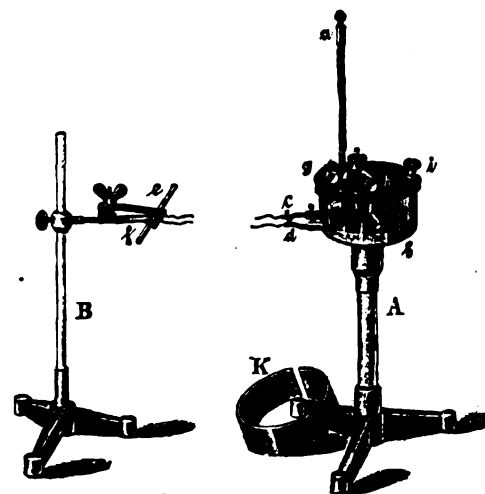


FIG. 1.

In order to show the presence of nodes and loops, Lecher placed a Plücker tube over the parallel wires. This tube lighted up when brought to a place over the wires where the fluctuations in potential, and consequently the P.D. at its electrodes reached a maximum—that is, at the loop of the wave. At the nodes, however, where there is no P.D. between the wires, the tube did not light up at all. A similar method was employed by Cohn and Heerwagen,^{*} also by Rubens.[†]

Aronst[‡] sealed the two wires into a glass tube which was about 2 m. long and connected with an air pump. In a darkened room the wires at the nodes were invisible, but at and for some little distance on both sides of the loop they were highly luminous.

To those demonstrators who wish to avoid the trouble of using an air-pump in connection with this experiment, and who have at their disposal a high-frequency coil, I recom-

* More exactly until the distance between the bridges plus one-half their combined length is equal to some multiple of a half-wave length.

† Such a Lecher apparatus is described in Weinhold's "Physikalischen Demonstrationen," III, Aufl. p. 840.

* "Wied. Ann.," 48, p. 368, 1891.

† "Wied. Ann.," 42, p. 154, 1895.

‡ "Wied. Ann.," 45, p. 553, 1892.

* From the "Electrician," London.

† "Wied. Ann.," 81, p. 551, 1898.

‡ "Wied. Ann.," 41, p. 860, 1890.

ment the Blondlot-Coolidge oscillator (made by E. Leybold's Nachfolger, Cologne). By the help of this apparatus the nodes and loops of stationary electrical waves can be shown on wires which are not in a vacuum, but in the open air. This apparatus has also the advantage of enabling one to isolate, measure, and if desired, photograph several of the overtones as well as the fundamental.

The Hertz oscillator plates are replaced by two semi-circular conductors (Fig. 1) which terminate at one end in small brass spheres, and are connected with the secondary terminals of a high frequency coil. The sparks which give rise to the electrical oscillations pass between the two brass spheres. A second spark-gap serves to increase the intensity of the oscillations. Both spark-gaps can be very delicately adjusted by means of insulated screws. Directly beneath this primary circuit of the oscillator and insulated from it by means of a sheet of mica is a secondary circuit. This latter consists of a wire bent into a circle of the same radius as the primary circuit, its ends terminating in the binding screws, c and d, and corresponds to the condenser plate of Hertz's apparatus. The vessel in which the two circuits are fastened is filled with kerosene. The copper wires (0.1 mm. in diameter) are held at one end by the screws c and d, and at the other by the insulated stand B. The ring K serves to darken the glass vessel.

If the apparatus is set in operation and the spark-gaps are properly adjusted, the wires become highly luminous throughout their entire length; and if now, by bridges properly placed on the wires, stationary waves are allowed to form, the wires at the nodes for a length of a few centimeters become invisible, while the other portions, and especially those half way between the nodes (the loops) remain luminous.

CHIMNEYS AND STACKS FOR STEAM BOILERS.*

BY W. H. WAKEMAN.

The statement that a chimney or stack is necessary to create draft under a steam boiler, except where forced draft is used, will occasion no surprise, because it is a self-evident truth. But all of the necessary appliances are not equally efficient, and in some cases the cause for the deficiency may be easily traced out, while in others it requires careful investigation in order to locate the trouble.

The theory of the cause for draft in a chimney is well known, but no other theory in relation to engineering is more persistently doubted, by the "practical" man, and there are not sufficient causes to warrant this continued opposition. I have never met a man who doubted the theory and could substitute a better one for it; the large majority of unbelievers do not attempt it.

This theory is as follows: Currents of air vary in density, consequently the more dense parts seek the lowest level, while the lighter parts rise as high as possible. As the lighter parts rise the heavier parts are drawn in to take their place, and if this process takes place in a chimney, and the only entrance to the base of it is through the furnace of a steam boiler, a draft will be created, the force of which will depend upon the comparative densi-

ty of the air, and gases inside and outside of the chimney, and for convenience sake this force is measured in inches of water.

From this it is evident that the lighter the gases are in the chimney the stronger will be the draft, so that while a high temperature of escaping gas denotes that much of the heat in the coal burned has not been absorbed by the boiler, and hence is at least a partial loss, the draft is increased over what it would be with a lower temperature; therefore, more power can be developed by the plant.

In many cases chimneys do not give as much draft as they were expected to, and are therefore considered detrimental to the economical combustion of the coal burned, and are condemned by the engineers in charge. The objects sought in writing this article are to point out some of the causes that are responsible for this undesirable state of affairs, in order that the blunders made may be rectified in the best way, while others may profit by the suggestions here offered and avoid future failures along this line; also, to show that the problems of chimney design are not as complicated as certain mysterious formulae used in this connection, in works on the subject would naturally cause us to believe.

In many cases the surrounding objects will determine the necessary height of chimney, for it would be a mistake to erect a chimney 100 feet high near a building that stands 125 feet above the ground, as the draft would be poor.

For the purpose of illustrating the rules to be given and explained, I shall assume that the chimney is to be 144 feet high, the temperature of the air 60° Fahrenheit and of the gases 500° Fahrenheit.

The draft will be determined by the difference in the density of the air and the gases, and by the height of the chimney. The density will vary as the absolute temperatures, and for the air it may be determined by dividing the absolute temperature of melting ice by the absolute temperature of the air, and multiplying the quotient by .0807. As the absolute temperature of a body or of gas is 461° more than its temperature by the thermometer, it is $32 + 461 = 493^\circ$ for melting ice. The absolute temperature of the air is $60 + 461 = 521^\circ$.

Then $492 \div 521 \times .0807 = .0763$.

The density of the gases is found by dividing the absolute temperature of melting ice by the absolute temperature of the gases, and multiplying the quotient by .084. Then $493 \div 961 \times .084 = .0430$.

Using the foregoing data we can determine the draft in inches of water by subtracting the density of the gases from the density of the air, and multiplying the remainder by .192 and again by the height of chimney in feet. Then $.0763 - .0430 \times (.192 \times 144) = .92$ inches of water.

I have given this example because it explains the process, but where no explanation is desired the following rule may be used, as it gives nearly the same result. Divide 7.66 by the absolute temperature of the gases and subtract the quotient from .0146. Multiply the remainder by the height of chimney in feet. In this case it is $7.66 \div 961 = .00797$, and $.0146 - .00797 \times 144 = .95$ inches of water.

For the same temperature, the draft for any other height may be found by proportion, as it varies with the height. For a chimney 200 feet high it is as follows: $144 : .92 : 200 : 1.27$ inches of water.

Disappointment is the result of expecting that the actual draft will equal this, as it will not; and yet the calculation so far given is correct, but no allowance has been made for the friction of the gases as they pass upward through the rough and sooty chimney or stack, and for ordinary cases, 10 per cent. should be deducted for this, which leaves .93 inches of water for the first illustration given.

Where we need the draft at the grate where the fuel is burned, and between this and the chimney, the passageway contains several obstructions in the form of a contraction at the bridge wall, where tubular boilers are used, a return bend in the combustion chamber, a division of the current when passing through the tubes, a right angle turn at the front end of the boiler and another one when the nearly horizontal flue is reached, and perhaps one or two more before the chimney is reached. About 25 per cent. reduction must be made for these, leaving an available draft of $.93 - (.83 \times .25) = .63$ inches of water, and where several boilers are connected to the same chimney, it may be expected that some of them will realize more of the draft than others. These rules for chimney draft are based on the assumption that the gases maintain a uniform temperature throughout their ascent through the shaft, but this is not true in practice, for as they travel farther away from the boiler, the temperature is reduced, thus bringing the density of them nearer that of the outer air. This will detract from their drawing power, and still it must be remembered that as the temperature is lowered, the volume is reduced, so that one tends to offset the other.

As already mentioned, some men dispute this theory, and, as evidence in their favor, point to the fact that a chimney will draw when there is no fire to heat the air in it. This is not strange, for in many cases it is heated by natural means, which answer every purpose. If the sun shines on an iron or steel stack, the internal air is warmed more than the outer, and draft is created. Even when the sun does not shine on it, the inside of the shaft is not exposed to the wind, hence it may be much warmer than the wind that blows against the outside of it.

Draft does not exist in all chimneys when cold, for I have had to build a fire at the base of the shaft, or in the breechen of the boiler, on several occasions in order to make the chimney carry off the smoke of a fire on the grate.

It is not a difficult matter to measure the draft of various chimneys, and note the results, taking their height and other conditions into consideration, when it will be found that sometimes a high chimney will give no more draft than a lower one does in another locality, but in all such cases there is some reason for the results, although it may not appear on the surface. A few years ago much was written concerning the great advantage of having a chimney flue larger at the top than at the bottom, and apparently very good reasons were given for the plan, but where one built in this way did give good results, we were never sure that some other condition was not responsible for the desirable condition of affairs.

I never knew of but one case where a stack that was larger at the top than at the bottom was taken down and reversed. This was of much interest, because it was set up again in the same locality, and the same boilers were used. After the change there was not enough difference to be perceptible in every day ser-

*Blondlot, "Comptes Rendus," 114, p. 283, 1892; Coolidge, "Wied. Ann.," 67, p. 578, 1899. See also Drude, "Zeitschrift f. Phys. Chem.," 23, 267, 1897.

*From "Modern Machinery."

vice, but a carefully graduated draft gauge showed a slight improvement with the small end of stack uppermost. As already observed, the ascending gases become cooler, and hence are reduced in volume, and therefore there is no logical reason for the top being the largest.

It is important that we know the amount of coal that it is possible to burn in one hour on each square foot of grate surface, and for making this calculation Prof. Thurston gives the following rule: Multiply the square root of the height by two and subtract one from the product. In this case it is 23 pounds.

Now I have no doubt that this rule is correct, for it is based on the results of experiments made and it can be, and is done in every day practice, but it results in a lower efficiency than can be secured by a slower rate of combustion, and where this rule is applied to lower chimneys with feebler draft, in order to burn the coal it calls for, it becomes necessary to "break the fire up" at short intervals, where bituminous coal is used, and every time this is done some of the good material is lost through the grates, and there is no help for it. When anthracite coal is used, the fires must be cleaned often, which results in a direct loss.

If a mechanical engineer should design a plant with the expectation of burning this amount of coal for ordinary service, it would be a great mistake. I would reduce it by 40 per cent., making it 13.8 pounds, as that is the most that should ever be burned, and when the load is lighter (as it varies in almost every plant), the amount would be less. Still, this would admit of an increase for short periods without serious detriment. It is proper to make the area of a chimney large enough to burn the maximum amount of coal that can be used on the grate, and then it can easily dispose of the smoke and gases resulting from any smaller quantity. This makes it necessary to know the number of square feet of grate surface, and for illustration it is assumed that there are three boilers, each having 30 square feet of grate surface. We then have 90 square feet, and 23 pounds for each, or 2,070 pounds per hour as the maximum quantity that can be burned.

The area of chimney in square feet is found by dividing the pounds of coal burned per hour by the square root of the height, multiplied by 12. In this case it is $2,070 \div 144 = 14.4$ square feet.

The diameter of a round flue that will contain this area is found by dividing by .7854 and extracting the square root of the quotient; $14.4 \div .7854 = 18.5$, the square root of which is 4.3 feet. If a square flue is wanted, it should not be less than four feet, because the corners are of little value, for the friction of the gases as they ascend in these parts is excessive, hence they may be ignored in a case like this. The horse-power of boilers that may be operated by this chimney can be determined by dividing the coal burned by 5, and $2,070 \div 5 = 414$ horse-power.

The allowance of five pounds of coal for a horse-power may be considered excessive, but it is customary to make this allowance, in order to be on the safe side. Automatic engines require less than this as a rule, but pumps require much more.

If it is desired to calculate the required area of flue by the horse power of chimney, it may be done on the same basis, by dividing the horse power by .2 of the height. Applying it here shows that the area is $414 \div (.2 \times 144) = 14.4$ square feet. It is much better, however,

to calculate directly on the amount of coal burned.

I am convinced that some reader will look over these calculations, and then find one or more chimneys that are not as large as they call for, so that a text will be afforded for another sermon on the difference between theory and practice, but I will make such investigations unnecessary by saying that I know of such cases right in the vicinity of where this is written, but they prove nothing against theory. If it could be proved that the best results are secured where such monstrosities are in use, then theory would have to be discounted, but as this is not done it will have to stand approved.

I will mention the essential features of a case with which I am well acquainted. The horizontal flue leading from a battery of boilers to a chimney is of the right size to suit the capacity of the steam generators, but the chimney area is only a trifle more than one-third of the flue area. This plant is run nearly every working day in the year, but an investigation of the practical results, and an interview with the engineer in charge, would convince the most skeptical that there is chance for much improvement.

In another case the brick chimney of a small plant did not give satisfaction and the owner put an iron cap on the top of it in which was a hole smaller than the conditions called for, and over this was erected an iron stack, which showed that the designer believed in having it high enough, but cared nothing for the area.

A certain class of objectors claim that it is not necessary to have a strong draft because the damper regulator is shut for a portion of the time, so it is just as well to have less draft, and let the damper be open for a greater portion of the time. This is a mistaken idea, for the fire should burn briskly while the draft is on, and when the required steam pressure is secured, it should be shut off until the pressure is slightly reduced. A good damper regulator will attend to this duty in a perfect manner. The philosophy of this is that while the draft is strong the combustion is more complete than when it is feeble. Another reason is that under these conditions much of the soot is swept through the tubes instead of being left in them; consequently the boiler gives better results from the fuel burned under it.

In some cases it may be convenient to know the power of a certain chimney to burn coal, as for instance where an old chimney is to be used for a new plant of boilers, or where a new chimney of a given size may be desired. This may be determined by multiplying the area in square feet by 12 and the product by the square root of the height. Suppose that a chimney is 120 feet high with a round flue 5 feet in diameter. The area is 19.6 square feet, and the square root of height is 11. Then $19.6 \times 12 \times 11 = 2,587$ pounds per hour.

According to a rule already explained, a chimney 120 feet high will burn 21 pounds of coal per hour on each square foot of grate. By dividing the total weight burned, by the latter, we find that the chimney will furnish draft for $2,587 \div 21 = 123$ square feet of grate, and for four boilers it will be 31 feet square feet for each.

I have noticed that in several cases where chimneys have not given satisfaction, they have been built higher in order to increase their capacity. This is good practice, but I wish to call attention to the fact that while

the force of the draft increases directly as the height is increased, its capacity for burning coal increases only as the square root of the height. This is an important point, for if it is not understood, disappointment may result, where an addition is built on to a chimney. If a chimney 80 feet high does not give sufficient draft, and it is possible to build it 80 feet higher, the force or intensity of the draft should be very nearly doubled.

To conclude that it will be possible to burn double that amount of coal with it would be a great mistake. Each pound of coal requires a certain amount of air for its combustion, and the amount passing into the furnace of a boiler will, of course, depend upon the rate at which it travels. Now the intensity of the draft denotes the pressure that is forcing air into the ash pit and up through the grates, but if this force is multiplied by two, the speed will be increased as the square root of two, which is 1.44. It follows as a natural consequence that if it is necessary to double the amount of coal burned, the height of chimneys must be multiplied by four, and if great exactness is desired enough more must be added to overcome the friction of the increased length of shaft.

A few years ago, if I had been called upon to decide whether to use a brick chimney or an iron stack, I should have favored the brick structure without hesitation, because iron stacks were proving failures after a few years of service, while bricks and mortar were not ruined by the different kinds of gases traveling upward, and were affected little by the rain traveling downward, while a coat of paint every year or two was not necessary.

Conditions are somewhat different now, for steel has replaced iron, proving much more durable, while improved methods have made it possible to erect these stacks and keep them in place during heavy gales without guys of any kind, to that as far as present experience will warrant an opinion, the two kinds are about on a par.

Before closing this article I wish to correct a mistaken idea that is often expressed by thoughtless people concerning the cause of a poor draft on some days where it is usually very good. Whenever the smoke curls lazily out of the chimney, and then seems inclined to come down to the ground instead of going into clouds, the remark is made that the draft is poor because the air is "heavy." If this is disputed, attention is called to the fact that the smoke comes downward, as truth of the proof of it.

The foregoing calculations concerning chimney draft were made with the assumption that the barometer stood at a certain given point and that the density of the air would correspond. If the barometer shows that the air is indeed heavier than the standard taken, the difference between the density of the air and of the gases will be greater, hence the draft will be stronger and not weaker. On the other hand, if the barometer shows the air to be lighter, the comparative density will be less, and as a natural consequence the draft may be less, in direct contradiction to the popular expression.

Dr. William F. Channing Dead.

Dr. William F. Channing, son of the philosopher, Dr. William Ellery Channing, died at the Perry Hospital in Boston on the 20th inst., aged 81 years. He was graduated in the class with Dr. Edward Everett Hale and later took

a doctor's degree from the University of Pennsylvania. He lived in Providence for many years. Pneumonia and a breakdown, due to advanced age, caused his death. Dr. Channing never practiced medicine, but was an inventor of great skill. The fire alarm telegraph, the marine railway and a score of appliances for use in electricity were his work.

IMPORT DUTIES IN THE ENGLISH COLONIES.

In view of the fact that American manufacturers of electrical machinery and appliances are reaching out for markets for their goods in the various English colonies, the rates of import duties leviable on electrical machinery and apparatus in those countries may not be without interest at this time.

BRITISH GUIANA.

Machinery and wire for electric lighting, free.

Machinery and apparatus for the original construction of an electric tramway in Georgetown, by the Demerara Electric Company, Limited, free.

Other machinery, part free, part 15 per cent. ad valorem. Under the last classification, machinery imported is subject to a deduction of 5 per cent. on the duties leviable at the rates given, provided the reciprocal trade convention between Great Britain and the United States in respect of British Guiana does not come into operation.

Implements for electric lighting, imported by the Mayor and Town Council of Georgetown or of New Amsterdam, for lighting any street or place belonging to them, or subject to their control, free.

Telegraph instruments and other materials imported by telegraph companies and necessary for the construction and use of their works, offices, and stations in the Colony, free.

Other, 15 per cent. ad valorem, subject to the same conditions as for "other machinery," above mentioned.

CANADA.

Glass bulbs for electric lights, 10 per cent. ad valorem.

Electric or magnetic machines for separating or concentrating ores, free.

Telephone or telegraph instruments, electric and galvanic batteries, electric motors, generators, dynamos, sockets, insulators of all kinds, and electric apparatus not elsewhere specified, 25 per cent. ad valorem.

Electric light fixtures, or metal parts thereof, including lava or other tips, collars, galleries, shades, and shade holders, 30 per cent. ad valorem.

Carbons, over six inches in circumference, 15 per cent. ad valorem.

Other electric light carbons and carbon points of all kinds, 35 per cent. ad valorem.

Steam and portable engines, boilers and machinery, composed wholly or in part of iron or steel, 25 per cent. ad valorem.

Wire, single or several, covered with cotton, linen, silk, rubber, or other material, including cable so covered, 30 per cent. ad valorem.

Other wire cable and stranded or twisted wire, 25 per cent.

Copper wire, plain, tinned or plated, 15 per cent.

Platinum wire, free.

[Note—In accordance with the provisions of

the British preferential tariff of 1898, as amended in 1900, articles which are the manufacture of the United Kingdom, when imported direct from that country, are entitled to a reduction of one-third of the duty.]

CAPE OF GOOD HOPE.

Machinery to be driven by electric power (including spare parts) and apparatus and appliances used in connection with the generating and storing of electricity, but not including electric cable, or wire, or the posts for carrying the same, and not including lamp posts, lamps, or their fitting, free.

Telegraphs and telephones, materials and instruments for use in construction and working of telegraph or telephone lines, free.

A rebate of the whole of the customs duties is allowed on the following goods imported into the Cape of Good Hope on their removal to places other than Natal, Orange River Colony, Basutoland and the Bechuanaland Protectorate, provided such places are open for trade, viz: Electric cable or wire and posts for the same, and their fittings; electric lamp posts and their fittings; electric lamps and switches, not including fancy or ornamental lamps, switches and fittings for indoor lighting, and signaling wire, bells and gongs, for use in or about mines. On other dutiable goods a rebate of 4½ per cent. is allowed.

CEYLON.

Prime movers and machinery (and component parts thereof), meaning machines or sets of machines to be worked by electrical power, free. The provision is made that only such articles shall be admitted as component parts of machinery as are indispensable for the working of the machinery, and are, owing to their shape or to other special quality, not adapted for any other purpose.

Instruments, scientific, or if intended for the professional use of passengers, free.

INDIA.

Prime movers and machinery, and component parts thereof, meaning machines or sets of machines to be worked by electric power, free.

Dynamos, accumulators, motors and electric fans, free.

Other (except telegraphic instruments and apparatus, and parts thereof, when imported by or under the orders of a railway company, or instruments, apparatus and appliances when imported by a passenger as part of his personal baggage and in actual use by him in the exercise of his profession or calling, which are free) 5 per cent. ad valorem.

JAMAICA.

Apparatus and appliances of all kinds for generating, storing, conducting and converting into power or light and measuring electricity, free.

Telephones and telephone switchboards, free.

Other, 16½ per cent. ad valorem. Telegraph materials imported into Jamaica by the International Ocean Telegraph Company, or by the Direct West India Cable Company, free.

MAURITIUS.

All kinds, 10 per cent. ad valorem.

NATAL.

Machinery to be driven by electric power (including spare parts) and appliances and apparatus used in connection with the generating and storing of electricity, but not including electric cable, or wire, or lamps or their fittings, free.

Telegraphs and telephones, materials and

instruments for use in construction and working of telegraph and telephone lines, free.

Other, 7½ per cent. ad valorem, with the same provision for rebate as applies to the Cape of Good Hope, as already noted.

NEWFOUNDLAND

Telegraph and telephone instruments, electric and galvanic batteries, 30 per cent. ad valorem.

Electric motors, dynamos, generators and sockets, 20 per cent.

Electric light fixtures or metal parts thereof, lamp springs and bulbs, electric meters, carbons and carbon points, and electric light material of every description, 30 per cent.

Insulators and other electrical apparatus, 20 per cent.

Copper wire, 30 per cent.

On all the above an additional charge of 10 per cent. on the duty leviable at the rate given.

NEW SOUTH WALES.

All kinds, free.

NEW ZEALAND

Electric machinery and appliances, including electrical hoists, electric light apparatus for dredging plants, electric motors, hand dynamos, and electric fans, 10 per cent. ad valorem.

Engines for electric lighting machinery, 20 per cent.

Electric cooking or heating apparatus, 20 per cent.

Brackets, standards, electroliners, and other fittings for distributing the light, 20 per cent. Lamps and lanterns, 20 per cent.

Lamps, arc, 10 per cent.

Globes, shades, chimneys, glass or metal, 20 per cent.

Telephones, free.

Electrical apparatus for surgeons' use, free.

Electric batteries and motors for dentists' use, 10 per cent.

Electric bell fittings (except cells for batteries, 10 per cent.), 20 per cent.

Electric pens and duplicating presses, 20 per cent.

Earthen and stone ware, china and porcelain, 20 per cent.

Copper wire, free.

NORTHERN TERRITORY OF SOUTH AUSTRALIA.

Telephones, free.

Gas and portable engines, free.

Other engines and parts, 15 per cent.

Bells, lamps and lampware, 15 per cent.

Copper wire, free.

Other, 10 per cent.

QUEENSLAND.

Electric machines, machinery and fittings, free.

Machinery for telegraphic purposes, free.

Gas and portable engines, free.

Copper wire, free.

Insulating materials, free.

Batteries, free.

Lamp globes, 15 per cent.

Other 25 per cent.

SOUTH AUSTRALIA (except Northern Territory).

Copper wire, free.

Batteries for telephones, telegraphs and medical use, free.

Batteries, other, 20 per cent.

Telephones, free.

Engines, portable and gas, free.

Other engines and parts thereof, 25 per cent.

Electric bells and bell indicators, 25 per cent.

Electric switches and cut-outs, 15 per cent.

Carbons for electric lighting, 15 per cent.
Other fittings or appliances unenumerated, 10 per cent.

STRAITS SETTLEMENTS.

All kinds, free.

TASMANIA.

Engines, engine fittings and electric machinery of all kinds, 10 per cent.

Electric light main cable, transformers connected therewith, and insulators for main cable, 10 per cent.

TRINIDAD AND TOBAGO.

Machinery free.

Other, 5 per cent. Goods for the use of the bureau for meteorological observations maintained in Port-of-Spain by the United States Government, free.

VICTORIA.

China ware, earthenware and porcelain, being telegraphic materials, free.

Globes and telegraph glassware, cut, embossed, etc., 2s. 6d. per cubic foot, including packing, measuring outside the package as imported.

The same, uncut, 1s. per cubic foot, including packing, measuring outside the package as imported.

Other glassware, 25 per cent.

Electric wire, covered or uncovered, free.

Electrical apparatus, free.

Electric fittings, viz.: arc lamps without globes, carbons, incandescent lamps, transmitters or transformers, and storage batteries, free.

Bell fittings, free.

Bells, 6 inches and under, free.

Lightning conductors, free.

Metal manufactures (including galleries for electric lamp sockets and for incandescent lamps, whether attached or not, electric staples and fittings for pipes and tubes) 30 per cent.

Electroliers, 30 per cent.

Machines and machinery for telegraphic purposes (but not including the motive power thereof), free.

Other machinery, including electric motors (except for dental purposes, free), 25 per cent.

Engines, other than portable, 30 per cent.

Portable engines, 15 per cent.

WESTERN AUSTRALIA.

Machinery, 5 per cent.

Parts of machinery, 10 per cent.

Electric batteries and meters 10 per cent.

Lamps and lampware, 10 per cent.

Other electric light material, electric bells (except for telegraphs and telephones), and cables, 5 per cent.

Earthen, glass, stone and china ware, not otherwise enumerated, 15 per cent.

Electric launches and electric bronzes (including lamps attached), 20 per cent.

Telegraph and telephone materials, including instruments, free.

Copper wire, and platinum wire and foil, free.

It should be borne in mind that in the tariffs of the several countries dealt with above there is no separate reference to electric machinery and apparatus. In such cases the rates of duty are given for those of articles with which the various kinds of electrical machinery and apparatus would probably be grouped, but it is not always certain how the tariff would be interpreted by the local customs authorities.

Meeting of the Electric Storage Battery Company.

The annual meeting of the Electric Storage Battery Company was held at Gloucester, N.J., on the 20th inst. The election for directors resulted as follows: P. A. B. Widener, W. L. Elkins, Daniel H. Shea, George A. Huhn, Thomas Regan, Herbert Lloyd, Thomas Dolan, W. W. Gibbs, Grant B. Schley, Issac L. Rice, George Philler, Rudolph Ellis, Joseph T. Sinnott, George H. Day, Phillip L. Dodge. There was no change in the board; 140,665 out of 160,000 shares were voted. The annual report made a favorable comparison with the two previous years. President Day stated that more than \$1,000,000 of unfilled orders were carried over on the books January 1, 1901. He said that there was money enough on hand to pay the next dividends, and that the prospects all pointed to the continuance of the dividend payments.

PERSONAL MENTION.

Engineers Deeley and Woolliscroft have been sent by the Midland Railway Company of London to this country to study American methods, including the adaptation of electricity to railroads.

Mr. Edwin Hanson, president of the Havana Electric Railway Company, who has been in Cuba for the last few weeks, recently returned to Montreal, Can., and expressed himself as perfectly well satisfied with the progress that has been made.

INCORPORATIONS.

The Soudnu Electric Company, El Paso, Tex. Capital stock, \$10,000.

The Astoria Electric Company, Astoria, Ore. Capital stock, \$900,000. Incorporators: Samuel F. Gordon, Frank R. Stokes and Charles H. Page.

The Union Township Electric Company, Elizabeth, N. J. Capital stock, \$2,000. Incorporators: John Kean, Hamilton Fish Kean, Julien H. Kean and others.

The People's Electric Light & Power Company, Kansas City, Mo. Capital stock, \$2,000. Incorporators: Hugh C. Ward, Charles E. Farley and Charles H. Rickert.

The Winstanley Electric Light, Power & Gas Company, East St. Louis, Ill. Capital stock, \$2,500. Incorporators: H. P. Taussig, W. W. Dean and Marc C. Gantier.

The Electrical Inspection & Maintenance Company, Pierre, S. D. Capital stock, \$250,000. Incorporators: J. H. Tomlinson, J. J. Post, Henry E. Leavitt and P. J. Knight.

The Electrical Appliance Company, Indianapolis, Ind. Capital stock, \$5,000. Directors: Elbridge E. Rines, Susan Rines, Christopher C. McCauley, Charles McCauley and John E. Booth.

The Southern Electric Company, El Paso, Tex.—to erect and repair electric light and power plants. Capital stock, \$10,000. Incorporators: D. L. Berkey, H. L. Lloyd and G. A. Andrews.

The Electro-Chemical Engraving Company, New York City. Capital stock, \$17,000. Directors: F. E. Switzer, Benjamin Woodruff and G. V. W. Switzer, all of New York City.

The Washington Power Company, Tacoma, Wash.—to deal in electric and hydraulic power and operate transportation lines. Capital stock, \$1,000,000. Trustees: J. L. McMurray, A. R. Warren, J. M. Ball and F. A. Rice.

The Hopewell Electric Light, Heat & Power Company, Trenton, N. J. Capital stock, \$100,000. Incorporators: Charles P. Fitch, Samuel H. Blackwell, Princeton, and Joseph B. Hill of Hopewell, N. J.

The J. B. Snyder Supply & Electric Company, Rochester, N. Y.—to deal in gas and electric fixtures. Capital stock, \$25,000. Directors: C. E. Snyder, W. C. Burnette and W. I. Peacock, all of Rochester.

The Consolidated Light & Power Company, Whitehall, N. Y.—to supply gas and electricity for light, heat and power purposes. Capital stock, \$75,000. Directors: Charles F. King, John H. Barker and Jere M. Cronin, all of Glens Falls.

The Consolidated Railway, Lighting & Refrigerating Company, Trenton, N. J.—to manufacture and supply electricity, gas, oil, compressed or liquid air to be used in connection with the lighting, heating, refrigerating ventilating and cleaning of railway cars and vehicles of all kinds. Capital stock, \$6,000,000. Incorporators: William C. Stemmerman, John H. Thompson, Jr., and Clifford W. Perkins.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED MARCH 19, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

670,145. Electric Switch. William F. Bossert, Utica, N. Y., assignor to the Bossert Electric Construction Company, same place. Filed June 7, 1900.

670,319. Underground Current-Supply for Electric Railways. Hermann T. Hillischer, Vienna, Austria, Hungary. Filed Oct. 26, 1900.

670,375. Contact-Shoe-Lifting Apparatus for Electric Cars. Joseph S. Morison, Richmond Hill, N. Y., assignor of one-half to John F. Bjurlund, Borough of Queens, New York City. Filed April 20, 1900.

670,390. Current-Interrupter in Conducting-Rail-Contact Systems. John F. Bjurlund, Richmond, Hill, N. Y., assignor of one-half to Joseph S. Morison, same place. Filed Sept. 26, 1900.

670,382. Trolley-Wheel. John Caldwell, Providence, R. I., assignor of two-thirds to John S. Kellogg, same place. Filed June 9, 1899.

670,384. Trolley-Rope Holder. John W. Clayton, Denver, Col. Filed Nov. 1, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

670,149. Time Switch for Electric Circuits. Ethan I. Dodds, Avalon, Pa., assignor to George Westinghouse, Pittsburg, Pa. Filed Sept. 9, 1899.

670,316. Incandescent Lamp. Reginald A. Fessenden, Allegheny, Pa. Filed Nov. 27, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

670,059. Commutator-Brush Holder. William D. Pomeroy, Akron, O., assignor to the Akron Electrical Manufacturing Company, same place. Filed Sept. 22, 1900.

670,119. Brush-Holder for Electric Machines. John Trier Chicago, Ill., assignor, by mesne assignments, to Donald Grant, Faribault, Minn. Filed April 26, 1900.

670,138. Speed-Regulator for Explosive-Engines. Emile L. P. Mors, Paris, France, assignor to Societe Anonyme D'Electricite et D'Automobiles Mors, same place. Filed March 6, 1900.

670,174. Ammeter. Gustav Grabosch, Berlin, Germany, assignor to Gans & Goldschmidt, same place. Filed Oct. 12, 1900.

670,203-670,204. Apparatus for Controlling the Motion of Electrical Switches. William Kingland, London, Eng. Filed Aug. 9, 1900.

670,324. Dynamometer. Karl Leverkus, Charlottenburg, Germany. Filed Jan. 2, 1901.

670,363. Electrical Coupling or Terminal. William Walker, Jr., Birmingham, Eng. Filed Sept. 15, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

670,022. Intercommunicating Telephone System. Newman H. Holland, Brookline, Mass., assignor to the Holtzer, Cabot Electric Company, same place. Filed Nov. 12, 1900.

670,408. Signaling Apparatus for Telephone-Stations. Thomas W. Loaring, Cleveland, O., assignor to the Cuyahoga Telephone Company, same place. Filed Oct. 27, 1900.

MISCELLANEOUS.

669,999. Electric Signaling Apparatus. Adolf Mensing, Berlin, Germany. Filed May 25, 1900.

670,005. Electric Exercising-Machine. Nelson H. Raymond, Buffalo, N. Y., assignor to Albert W. Courtney, same place. Filed Aug. 14, 1900.

670,024. Process of Making Active Material for Accumulator Plates. Ernst W. Jungner, Stockholm, Sweden. Filed May 12, 1900.

670,026. Electric Cigar-Lighter. Alfred B. Kittson, Boston, Mass. Filed Oct. 24, 1900.

670,062. Coin-Freed Apparatus for Gramophones. Belford G. Royal, London, Eng., assignor to the Gramophone Company, Limited, same place. Filed Nov. 13, 1899.

670,121. Running-Gear for Automobiles. William Van Wagoner, Syracuse, N. Y., assignor to the Century Motor Vehicle Company, same place. Filed April 2, 1900.

670,142. Electrolytic Current-Interrupter. Arthur Wehnelt, Charlottenburg, Germany. Filed May 16, 1899.

670,172. Electric Water-Heater. Waldo F. Follett, New Haven, Conn. Filed Dec. 10, 1900.

670,189. Starting Mechanism for Automobiles. Henry Wilcke, Detroit, Mich., assignor of one-half to John Arthur Robinson, Armley, Eng. Filed Aug. 30, 1900.

670,201. Process of Producing Zinc Oxide and Nitrites. Edward D. Kendall, Brooklyn, N. Y., assignor of one-half to Ferdinand F. Cimiotti, New York City. Filed Oct. 11, 1900.

670,252. Igniting-Device. Ernest Schmidt, Wilmersdorf, Germany. Filed Jan. 19, 1900.

670,274. Switch for Suspended Electric Conductors. John Floyd, Washington, D. C. Filed Feb. 2, 1900.

THE TELEPHONE WORLD.

Progress of the Independent Telephone System.

George W. Beers of the Telephone, Telegraph & Cable Company of America, who has been West superintending the development of that company's many properties, has returned to this city. Mr. Beers is optimistic on the independent telephone movement outlook. He says the most important news in the independent situation is the recent Berliner decision, which has put every one at rest as to the absolute security of his independent telephone investments.

"I think the movement will get a fresh growth from the Berliner decision," he said recently. "In communities where there has been no independent telephone system franchises are now sought, and it will not be long before the systems are in operation. Probably the best instance of this is found at Dayton, O., where there has been no independent telephone system, although in almost every other city in Ohio a strong independent company is in operation. I understand that a franchise has been secured from the municipal authorities and active work will soon begin there."

Articles of incorporation have been filed by Charles Church, H. L. Frye and Phoebe Church, who have formed themselves into a company to be known as the Northfield, Minn., Telephone Exchange Company. The articles state that it is the purpose of the company to construct and operate telephone lines and exchanges, and that Northfield will be the principal place of business. The capital stock amounts to \$15,000. The highest amount of indebtedness or liability to which the company will be liable is limited to \$10,000. The board of directors consists of the first-named persons, who hold office until the first annual meeting or until their successors are elected and qualified.

The Southern New England Telephone Company is about to install in the large cities of the State of Connecticut, a new battery system, by which the use of a call bell is done away with, the subscriber having merely to take the ear piece off the hook. This and other improvements contemplated will involve an expenditure of \$250,000, it is announced, and the other improvements include the erection of an addition to the company's building in New Haven and a new building in Bridgeport.

A. W. Huggins, of London, Ky., has secured the right of way to build a telephone line from there to Manchester, and is organizing a stock company for that purpose. As soon as the line is completed to Manchester he will extend it to Hyden and on to Hazard. This line will be of great value to the merchants of Louisville and Lexington, as these two cities will be put in direct telephonic communication with the merchants of Clay, Perry and Letcher Counties.

The Home Telephone Company, Elkhart, Ind., has been compelled to order a new switchboard as the present capacity of 600 has been exceeded by over 30 orders. The company under the present management now furnishes one of the most efficient independent telephone services in the country. The independent companies are fast forming a perfect system.

A short time ago the Connecticut Telephone & Electric Company of Meriden, Conn., received a Government order for one hundred telephones for the War Department. The work has been completed and the 'phones shipped; they will be sent to Cuba to be used mostly in Havana and other cities. The telephones are equipped with all the latest patents.

The Chesapeake Telephone Company of Williamsburg, Va., has completed its connection with Yorktown of that State, and will be ready shortly to give long distance service to its subscribers.

The Bell Telephone Company will begin in a short time to considerably enlarge its underground wire system in the northern section of Trenton, N. J.

The Mansfield, O., Telephone Company has purchased the Star Telephone Company's lines in Richland County and a telephone war is on.

The Franklin County Telephone Company has petitioned the selectmen of Swanton, Vt., for a franchise to establish a local exchange in that town.

The total wire mileage construction of the Erie telephone system last year was 98,934 miles, of which 45,957 miles were underground.

The Virginia, Ill., & Little Indian Telephone Company has increased its capital stock from \$400 to \$5,000.

Southern States 'Phone Improvements.

The Southern States Telephone Company, a Maryland corporation operating exchanges in Norfolk, Portsmouth and Berkley, Va., filed a mortgage in Norfolk, March 20, to the Fidelity & Deposit Company of Baltimore to secure a bond issue of \$150,000. Of this \$50,000 will be used in retiring a previous bond issue and \$100,000 in improving and extending the company's lines thereabouts. It is understood that the connection by long distance wires of many towns south of York, Pa., is proceeding, and that the Southern States Company, of which Seymour Mandelbaum, of Baltimore, is president, will shortly be in active competition with the Bell Company in long-distance telephones as well as locally.

The Northwestern Telephone Exchange Company of Minneapolis, Minn., expects to begin its improvements early in May. Superintendent Wainman says: "As soon as the frost is out of the ground we will begin the work of increasing and improving our facilities. This means the laying of more wires and the construction of more cables and conduits. The East Side station will be occupied as early in the spring as possible. We expect that the trouble with the city over permits for laying underground and overhead wires will be settled amicably in a short time and as soon as the weather and ground permit we will get to work. These new facilities will enable us, when completed, to accept more subscribers for the lower classes of service, such as the nickel-in-the-slot and four party lines." The Northwestern does not contemplate any toll line extensions in Minnesota to speak of. Several short lines in North Dakota will be built and possibly an extension from Larimore to Devil's Lake.

The independent telephone companies in Iowa are endeavoring to get protection from the State through legislation against the warfare made by the Bell companies upon local independent companies. At the meeting of the Iowa Telephone Association a resolution was passed to ask for legislation to prevent the slashing of rates. It asks for a law making it illegal for a telephone company to make a lower rate in one city or town than in another and to compel uniformity in rates. It is claimed the Bell Company drives out opposition by cutting rates and independent companies cannot exist, thus competition is destroyed.

The Oil Belt Telephone Company is making arrangements to put in a telephone exchange at Bloomdale, O., and connect with the long-distance toll lines of the United States Telephone Company at Bowling Green, O. This exchange will furnish 'phones for the oil fields within three miles from Bowling Green. This company will be in competition with the Central Union Telephone Company, which now has an exchange established at the latter place with 60 'phones on the list.

Although there have been reports regarding the inactivity of the Knickerbocker Telephone & Telegraph Company in New York City, it was learned last week that constructive work is being pushed forward in the upper part of the city and toward Yonkers. President Eckert said recently that while the work was somewhat slow, still progress was made. But very little line work is now constructed in Brooklyn, as the company is centering its efforts in the Bronx.

The Mississippi Valley Telephone Company has lately been reorganized, and is to be called the Twin City Telephone Company; the number of directors is changed from five to seven. Large amounts of money will be spent in improving and enlarging the plant in Minneapolis and St. Paul, Minn.

According to news from Charlotte, N. C., the Curtis syndicate of Newark, N. J., represented by Mr. J. B. Curtis, has purchased the plant of the Queen City Telephone Company at a receiver's sale for \$23,000, the plant having cost between \$40,000 and \$50,000.

The Bell Telephone Company stockholders will again vote on an increase in the capital stock. A special meeting is called for May 21. The proposed increase is \$2,000,000, making the total outstanding \$8,000,000.

A charter was issued by the Pennsylvania State Department last week to the Southern Telephone & Telegraph Company of Kirkwood, Lancaster County. The capital stock is \$10,000.

The Dirigo Telephone Company of Maine is now operating in Dixfield, and already has six wires working.

The Adel, Ga., Telephone Company has made application for a charter.

Toronto Opposes an Advance in 'Phone Rates.

The corporation of the city of Toronto petitions the Government to enforce the clause in the act of 1893 providing that existing rates should not be increased by the Bell Telephone Company without the consent of the Governor-General-in-council; also, that the company be obliged to supply telephones to all persons who require and are willing to pay for the same.

Since the independent telephone company, which sought a franchise in Rockford, Ill., some time ago was turned down in favor of the Central Union Company, there has been a marked reversal of sentiment and it is an evident fact that should another well backed concern seek to gain a franchise it would be able to do so with little difficulty. The fact, says an Illinois paper, that the supervisors, a proverbially conservative body, have granted a franchise to the independent company for rural 'phones shows the tendency of the tide in that city.

The Independent Telephone Company, of Lebanon, Ind., has granted the co-operative people free service. The franchise that forbids the consolidation of the two Thorntown companies will be adjusted at the first meeting of the town council. Patrons of the Lebanon company now have free communication with Thorntown, Jamestown, Zionsville, Whitestown, Advance, Ind., and other points.

News from Wheeling, W. Va., states that a telephone war between the Bell Company and the National, a new company, composed almost exclusively of local people, is scheduled to begin April 1. The Bell people are charging \$100 a year for business telephones and \$50 a year for residences. The National has placed its rates at \$35 a year for business 'phones and \$18 a year for residences.

A petition is being circulated in Watertown, N. Y., and largely signed by patrons of both local telephone lines, the Bell and the Citizens', by which the signers bind themselves to a concerted effort to bring about the consolidation of the systems or the elimination of one of them.

George E. McGarland, of Davenport, superintendent of the Iowa Telephone Company, was in Sioux City recently completing arrangements for work to begin on the copper circuit toll line between Sioux City and Des Moines. The improvement will cost \$50,000.

The Scott County Telephone Company in Kentucky has absorbed two of the others and a plant with 200 drops will be immediately installed at Scottsburg. This leaves the fight between the Cumberland and the new company.

The Southwestern Telephone & Telegraph Company is making rapid progress in putting in its local exchange at Hempstead, Tex. In a few weeks it will have everything running in smooth order.

Fairmount & Matthews of Indianapolis, Ind., have organized an independent telephone company, with R. C. Nottingham president, and will put in twenty-five instruments.

A number of farmers living between Colfax and Almota, Wash., are putting in a barbed wire telephone line, using the barbed wire fences on their farms for this purpose.

The Western Union Telegraph Company, and the Gonzales Telephone Company of Gonzales, Tex., are receiving quantities of cedar poles to repair and extend their lines.

A telephone line is to be established from Mt. Olivet in Piqua, Ky., a distance of five miles, an enterprise much needed.

A movement is on foot to establish another telephone exchange in Greenville, Tenn.

The Delta, O., Home Telephone Company has increased its capital stock from \$10,000 to \$20,000.

TELEPHONE INCORPORATIONS.

The New England Wireless Telegraph & Telephone Company, Pierre, S. D. Capital stock, \$5,000,000. Incorporators: Francis H. Banks, Thomas B. Bishop and Leroy C. Smith.

The Terrace City Telephone Company, Kansas City, Mo.—to do business in Kansas City, Mo., and Kansas City, Kan., Capital stock, \$500. Incorporators: Hugh C. Ward, Fred. Huttig and Ferd. Heim.

The Livonia Telephone Company, Livonia, N. Y. Capital stock, \$1,000. Directors: E. A. Bronson, C. E. Hartson and W. B. Thurston, all of Livonia.

GENERAL ELECTRICAL NEWS.

Lighting.

Aurora, Neb.—The question whether the city will purchase the present electric light plant, enlarge it, and operate it, etc., will be submitted to the voters this spring.

Bellaire, Mich.—The new village council is in favor of erecting an electric light plant.

Bloomfield, Ind.—The town trustees have awarded a franchise for electric lighting and power to E. H. Dugger and J. E. Meredith to be completed before December 1.

Burnside, Ky.—The Burnside Electric Light & Power Company recently filed articles of incorporation. The capital stock is \$4,500. Ralph McCrackin is interested in the concern.

Cambridge, Mass.—The Cambridge Electric Light Company proposes to erect a new electric light station, at a cost of about \$250,000, which will be one of the finest in the country. The proposed plant will have 10,000 horse-power, supplying a current for more than 100,000 lamps.

Clyde, N. Y.—The electric department of the Clyde Gas & Electric plant was ruined by fire March 21. The plant is owned by Edward M. Moir of Marcellus. The loss is \$10,000, fully insured.

Coleman, Tex.—A. L. Dickinson is preparing to erect an electric light plant here.

Colfax, Wash.—New engines and boilers are to be installed at the Coad & Mackenzie electric light plant by July 10.

Creighton, Neb.—A stock company is to be organized here for the purpose of putting in an electric light and steam heating plant.

Elk Point, S. D.—An election will be held next month to vote on the question of erecting an electric light plant here.

Frenchtown, N. J.—This borough has passed an ordinance giving J. Hyde of Trenton the right to construct and operate an electric light plant.

Georgetown, Del.—An election will be held for the purpose of voting on the question of issuing bonds for an electric light plant.

Harbor Springs, Mich.—The proposition to bond the village for \$10,000 to extend the electric light plant of this village was lately passed.

Kearney, Neb.—Col. Blees of Macon, Mo., owner of the Kearney electric light plant, contemplates the enlargement and improvement of the plant.

Prescott, Wis.—H. C. Mercord, proprietor of the Prescott electric light plant, is preparing to enlarge and remodel his plant.

Statesboro, Ga.—The establishment of an electric light plant here is talked of.

St. Louis, Mich.—The city council has decided to submit a proposition to the voters at the coming election to bond the city for \$8,000 to improve the electric light plant and waterworks system.

Tifton, Ga.—The mayor will soon advertise for bids for lighting the town by electricity.

Stonington, Ill.—An electric light plant will soon be built here.

Terre Haute, Ind.—The Southern Indiana Railway Company will install a complete electric light plant in its new round house.

Washington, D. C.—The Treasury Department has signed a contract with Frederick Pierce of New York for installing the electrical apparatus in the various immigration buildings at Ellis Island. The contract involves the expenditure of \$25,000.

Willimantic, Conn.—Corporation Counsel W. A. King states that the Gas & Electric Light Company has decided to improve its plant in this city, and will expend from \$50,000 to \$80,000 on it.

Street Railways.

Alton, Mo.—An electric railway from here to St. Louis is said to be projected by the Eastern capitalists who financed the Alton Railway, Gas & Electric Company.

Altoona, Pa.—The City Passenger & Logan Valley Electric Railway interests have again changed hands.

Bloomington, N. Y.—Paul Smith and Wallace Murray have secured options on certain water powers in the Adirondacks, including Franklin Falls, Wellington Notch, Hull's Falls and Saranac Lake, and propose to establish a trolley line in that region. It is planned to run the road from here to Saranac Lake, thence to Lake Placid, eastward to the Keene Valley and down the Au Sable Valley to Keeseville. Such a route would be more than 30 miles long.

Charleston, S. C.—The Charleston Suburban & Summerville Railway Company has been incorporated to construct an electric railway between this city and Summerville, a distance of 28 miles. The capital stock is \$600,000, and the directors are J. J. O'Connell, B. P. Evans and J. W. Simons.

Galion, O.—A franchise has been granted to F. D. Carpenter and S. N. Coe of Cleveland by the county commissioners of Crawford County for an electric line from this place to Crestline.

Girardville, Pa.—The Schuylkill Traction Company has authorized a mortgage for \$2,000,000 for extensions to Pottsville, Hazleton and Tamaqua.

Grand Rapids, Mich.—The officials of the Grand Rapids, Spring Lake & Grand Haven Electric Railway Company, after consulting with a representative of a New York financial house, decided to float a bond issue to the amount of \$4,000,000 with a view to constructing the road.

Harvey's Lake, Pa.—This place is to have a new electric railroad. A number of well known capitalists of Wilkes-Barre recently obtained a charter, secured the right of way and work will begin soon.

Huntsville, Mo.—There is talk of an electric line between here and Moberly.

Natchez, Miss.—G. Ross of Chicago, S. A. Duncan of Atlanta, and J. Z. George of Vicksburg, have been in this city making a preliminary survey with a view to putting in an electric street railway system.

Paulding, O.—S. S. Shisler and other business men of this place are agitating the building of an electric railroad from Continental, taking in all the towns to Latty, thence to Paulding and terminate at Antwerp. It is proposed that a stock company of Paulding County men be organized for this purpose.

Port Chester, N. Y.—The authorities of this place have granted a franchise to the Port Chester Street Railway to extend its trolley lines across the Byram River bridge, which connects this State with Connecticut.

Redwood, N. Y.—The proposed trolley line between here and Alexandria Bay is again being talked of.

Tampa, Fla.—The Tampa Electric Company is preparing to spend thousands of dollars in the further completion of its street railway service.

Wausau, Wis.—The Wisconsin River Valley Electric Railway Company will build and equip an electric street railway to connect this place and Merrill, and in time the line will be extended south to Nekoosa and north to Eagle River. T. F. Frawley, C. T. Bundy and R. P. Wilcox are interested in the enterprise.

Windsor, Ont.—The bill of incorporation of the Windsor, Essex & Lake Shore Railway has been passed. Electricity is named as the motive power. The road will run from this place to Wheatley and is capitalized at \$5,000,000.

Manufacturing.

New York City.—The United Telpherago Company, capitalized at \$1,500,000, has lately been formed to manufacture telpherago devices, vehicles, etc. Among those interested are Charles M. Clark, New Jersey; Henry McL. Harding, and H. H. Tyndale New York, and Walter T. Wallace, Glen Ridge, N. J.—Patrick J. Kennedy, John J. Quigley and K. K. McLaren are the promoters of the Thomas Hoey Supply & Manufacturing Company; capitalized with \$200,000; to manufacture electrical supplies.

Niles, O.—The Wiswell-Pritchard Electric Manufacturing Company is the name of the concern formed here to manufacture electric lamps and transformers. W. H. and P. J. Pritchard, F. W. Stillwagon, H. W.

Wiswell and C. M. Wilkins comprise the firm, which is capitalized at \$30,000.

Rochester, N. Y.—The Crescent Electrical Manufacturing Company of this city was lately organized with \$2,000 capital stock. C. R. Elliott, A. L. W. Miller and H. W. Russell are the directors.

Tacoma, Wash.—The Manufacturers' Railway Company has been incorporated by Everett G. Griggs, George J. Osgood, W. W. Lytle and John B. Hardy for the purpose of building street railways, suburban and other railroads, and to operate them with steam, electric current or other motive power.

Toledo, O.—Joseph L. Yost has acquired possession of the Dickson electric keysocket patent and will put it on the market, also a general line of electrical supplies will be manufactured in connection with the socket.

Company Matters.

Menomonee, Wis.—The Menomonee Submerged Motor Company has increased its capital stock to \$100,000 and elected the following officers: President, James H. Stout, Menomonee; vice-president, T. B. Hatch, Chicago; secretary and treasurer, John Haggood, of this city.

New Bedford, Mass.—At the recent annual meeting of the W. S. Hill Electric Company the treasurer's report showed the company to be in a prosperous condition.

Power and Transmission.

Albany, N. Y.—Last week a bill was introduced in the Assembly for the organization of the Lower River Power Company of Niagara, a rival of the present power company, and which starts with the avowed purpose of supplying electric power and water for New York City, through lines to be constructed along the Erie Canal. The capital stock is to be \$5,000,000. Commodore P. Vedder, Tunis G. Bergen, William Williams, Charles E. Hotchkiss and Dewitt V. D. Reilly, of New York; Patrick F. King, George W. Knox and James S. Simmons, of Niagara Falls, are back of the scheme.

Belvidere, N. J.—There is much talk of damming the Delaware River so as to get power for use in all the neighboring towns. The Delaware Power Company has been organized with a capital of \$200,000, and it is said will push the work as soon as spring opens.

Fayetteville, N. C.—The Cape Fear Electric Power Company proposes to generate the electric power at Buckhorn for transmission to this city. Mr. Gray, of this city, is one of the promoters of the enterprise.

Nashville, Tenn.—The charter of the Great Falls Power Company of Davidson County was registered a short time ago. The company is capitalized at \$20,000, and proposes to utilize the power at the falls to generate electricity and convey it to this city to be used for light and power. Thomas G. Kittrell, George Jungermann, R. D. Goodlett, Arthur J. Dyer and Wm. O. Vertrees are the promoters of the scheme.

Mines.

Boulder, Col.—An electro-chlorination mill is soon to be built at Wall Street Camp at a cost of \$125,000.

Leadville, Col.—Work on the construction of the electric power plant at Homestake Creek, Eagle County, which is to be built by the Leadville Electric Power Company will soon be commenced. The company expects to generate not less than 10,000 hp. and will be prepared to equip a system that will embrace all the mines of the Arkansas Valley as far south as Buena Vista.

Automobiles.

Joplin, Mo.—Reynolds, Graves & Co., are now in their new building, which was erected especially for the manufacture of automobiles. It is complete in every respect.

Toledo, O.—An automobile system to Ottawa Park is one of the projects of this coming season.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mgt., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Authorz'd	Issued.				
Albany, N. Y. —Mar 25					
United Traction Co. (Consolidation of the Albany and Troy City Railway.)	100	\$5,000,000	\$5,000,000	1 1/2 % Q.	108 1/2 109 1/2
Allentown Pa. —Mar 25					
Allentown & Lehigh Val. Trac. Co.	100	4,000,000	1,500,000	—	15
Bridgeport, Conn. —Mar 25					
Bridgeport Traction Co.	100	2,000,000	2,000,000	1 % Aug.	100
Baltimore Md. —Mar 25					
a United Railways & Elec. Co. com.	50	24,000,000	18,000,000	—	16 1/2 17
Boston, Mass. —Mar 25					
New England Street Ry.	25	5,000,000	1,081,925	1 % Q., Jan. 15,	—
North Shore Traction Co. com.	100	4,000,000	4,000,000	—	15 16
North Shore Traction Co. pfd.	100	2,000,000	2,000,000	6 % S. A. & O.	85 87
West End Street Ry. Co. com.	50	10,000,000	9,080,000	3 1/2 % S. Oct., '99.	112 118
West End Street Ry. Co. 8 % pfd.	50	4,400,000	6,400,000	4 % S. Jan.	112 118
Boston Elevated R. R.	100	10,000,000	—	2 1/2 % Aug. 90,	168 169
Brooklyn N. Y. —Mar 25					
Brooklyn City Ry.	100	2,000,000	1,928,400	—	235 240
Brooklyn Rap. Transit Co., tr. cert.	100	48,000,000	48,000,000	—	81 1/2 81 1/2
a Brooklyn Heights Railroad	100	200,000	200,000	—	107 109
a Brooklyn City RR. guar.	100	12,000,000	12,000,000	8 % Q., Jan.,	237 239
Coney Island & Brooklyn RR.	100	2,000,000	2,000,000	—	—
Kings County Elevated	100	2,000,000	1,884,200	2 1/2 % Nov., '99.	825 832
Kings County Traction Co.	100	4,750,000	4,750,000	—	—
Nassau Electric Railroad	100	4,500,000	4,500,000	1 % July	—
a Atlantic Avenue Railroad	50	6,000,000	6,000,000	—	75 80
a Brooklyn, B. & W. R. Railroad	50	2,000,000	2,000,000	—	—
Buffalo N. Y. —Mar 25					
Buffalo & Niagara Falls Elec. Ry.	100	1,250,000	1,250,000	1 % Q. Dec., '90.	74 75
a Buffalo Railway Co.	100	6,000,000	5,870,500	—	99 100
Columbus O. —Mar 25					
Columbus Street Railroad	100	8,000,000	8,000,000	1 % Q., Feb.	36 39
Columbus Street Railroad, pfd.	100	1,500,000	1,500,000	—	92 98
Charleston, S. C. —Mar 25					
Charleston City Ry. Co.	50	100,000	100,000	8 % S.	—
Enterprise City RR. Co.	25	1,000,000	350,000	—	—
Chicago, Ill. —Mar 25					
Chicago City Ry. Co.	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99.	255 260
Chicago & South Side R. T. RR.	100	10,828,800	10,828,800	—	94 10
Lake Street Elevated RR.	100	10,000,000	10,000,000	—	82 1/2 83
Metropolitan West Side Elev. Ry.	100	15,000,000	7,000,000	Feb. 28 1900.	79 80
Met. West Side El., pfd.	100	15,000,000	9,000,000	—	309 210
North Chicago St. RR.	100	10,000,000	6,000,000	8 % Q., Jan.	197 200
South Chicago City RR.	100	500,000	249,900	—	99 1/2 103
West Chicago St. RR. Co.	100	2,000,000	1,608,200	—	104 1/2 103
Union Traction Ry. Co. com.	100	20,000,000	18,189,000	1 1/2 % Q., Feb.	15 1/2 15 1/2
Union Traction Ry. Co. pref.	100	1,250,000	624,900	8 % S.	56 56 1/2
Cincinnati, Ohio. —Mar 25					
Cincinnati Inc. Plane Ry. com.	50	1,000,000	575,000	—	—
Cincinnati Inc. Plane Ry. pfd.	50	150,000	150,000	—	—
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2 1/2 % Feb.	75 76
Cincinnati Street Ry. Co.	50	18,000,000	14,000,000	1 1/2 % Q., Jan.	124 1/2 125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1 1/2 % Q., Jan.	126 1/2 127
Cleveland, Ohio. —Mar 25					
Akron, Bed. & Clev. Elec. Ry.	100	1,000,000	1,000,000	—	48 50
Cleveland City Ry.	100	8,000,000	7,600,000	8-5 % Jan.	102 102 1/2
Cleveland Electric Ry.	100	12,000,000	12,000,000	3/4 % Q., Oct., '99.	88 84 1/2
Detroit, Mich. —Mar 25					
Detroit Citizens' Street Ry.	100	2,000,000	1,250,000	—	100 100
Fl. Wayne & Belle Isle Ry.	100	1,200,000	1,200,000	—	170 170
Rapid Railway Co.	100	250,000	250,000	—	90 100
Detroit Electric Railway	100	1,000,000	1,000,000	—	—
Wyandotte & Detroit River Ry.	100	250,000	200,000	—	100 110
Dayton O. —Mar 25					
City Railway Co. com.	100	1,500,000	1,470,600	1 1/2 % Q.	140 145
City Railway Co. pfd.	100	600,000	600,000	1 1/2 % Q.	170 170
People's Street Railway	100	1,100,000	1,100,000	—	114 115

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Authorz'd	Issued.				
Hartford Conn. —Mar 25					
Hartford Street Ry. Co.	100	84,000,000	8200,000	8 % S. Oct.,	190
Hartford & West Hartford RR.	100	1,000,000	247,000	—	—
Holyoke Mass. —Mar 25					
Holyoke Street Ry. Co.	100	400,000	400,000	8 % A., June,	207 1/2 210
Hoboken N. J. —Mar 25					
North Hudson Co. (N. J.) Ry. Co.	25	1,250,000	1,000,000	8 %	180
Indianapolis, Ind. —Mar 25					
a Indianapolis Street Ry.	100	5,000,000	5,000,000	—	25 25 1/2
Lancaster, Pa. —Mar 25					
Pennsylvania Traction Co.	100	10,000,000	9,900,000	—	—
Lancaster & Col. Electric Ry.	100	—	87,500	—	—
West End Street Railway	100	—	—	—	—
Louisville, Ky. —Mar 25					
Louisville Ry. Co. com.	100	4,000,000	3,500,000	1 1/2 %	82 83
Louisville Ry. Co. pfd.	100	2,500,000	2,500,000	2 1/2 % S. Oct. 1,	112 118
Minneapolis, Minn. —Mar 25					
Twin City Rapid Transit Co. m.	100	17,000,000	15,010,000	—	68 1/2 68 1/2
Twin City Rapid Transit Co. f. d.	100	8,000,000	1,712,200	1 1/2 % Oct.	186 187
Montreal, Canada. —Mar 25					
Montreal Street Ry. Co.	50	4,000,000	4,000,000	8 % S. M. & N.	268 1/2 265
Toronto Street Ry. Co.	100	6,000,000	6,000,000	1 1/2 % S. J. & J.	106 1/2 109 1/2
Memphis Tenn. —Mar 25					
Memphis Street Railway Co.	100	500,000	500,000	—	25
New Haven, Conn. —Mar 25					
Fair Haven & Westville RR.	25	2,000,000	2,000,000	8 % S. Sept.	89 41
New Haven Street Railway Co.	100	1,250,000	1,000,000	2 1/2 % A., July	—
New Haven & Centerville	100	700,000	800,000	—	—
Winchester Avenue RR.	25	1,000,000	600,000	—	45 46
New Orleans, La. —Mar 25					
Canal & Claiborne RR. Co.	40	240,000	240,000	4 % S. July,	—
New Orleans & Carrollton RR.	100	1,200,000	1,200,000	1 1/2 % Q., Oct.	148 1/2 158
New Orleans Traction Co. new com.	100	—	—	—	22 1/2 24
New Orleans Traction Co. new pfd.	100	—	—	—	96 96
a Crescent City RR. guar.	100	2,000,000	2,000,000	8 % S. Jan.,	20 1/2 26
a New Or. City & Lake RR. guar.	100	2,000,000	2,000,000	4 % S. Jan.,	—
Orleans Railroad	50	500,000	185,000	1 1/2 %	52
St. Charles Street Railway	50	1,000,000	1,000,000	1 1/2 % Oct.,	56 1/2 57
New York—Mar 25					
Central Croton RR.	100	600,000	600,000	2 1/2 % Q.	285 300
a Christopher & 10th Sts. RR. guar.	100	650,000	650,000	2 % Q., Oct.	175 185
Dry Dock, E. Bldg. & Battery RR.	100	1,200,000	1,200,000	1 1/2 % Q., Nov.	120 120 1/2
a Metropolitan Street Ry. Co.	100	45,000,000	45,000,000	2 1/2 % Q., Feb. 1900.	163 168 1/2
a Bleeker St. & Fulton St. Ry. guar.	100	900,000	900,000	3 1/2 % A., July,	85 87
a Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000	2 1/2 % Q.	282 240
a Gen. Park N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2 1/2 % Q.	192 200
a Eighth Avenue RR.	100	1,000,000	1,000,000	—	890 405
a 42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	4 % Q.	802 402
a Ninth Avenue RR.	100	800,000	800,000	—	198 201
a Sixth Avenue RR.	100	2,000,000	2,000,000	—	205 225
a Twenty-third St. R. R. Co. guar.	100	600,000	600,000	4 % Q.	408 410
Second Avenue RR.	100	2,500,000	1,862,000	2 % Q., Jan.	198 201
Third Avenue RR.	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.	121 121 1/2
a 42d St., Manhattan & St. Nich. Av.	100	2,500,000	2,500,000	—	65 75
a Union (Huckleberry) Ry.	100	2,000,000	2,000,000	—	190 200
Newark N. J. —Mar 25					
Consolidated Traction Co. of N. J.	100	15,000,000	15,000,000	—	62 1/2 68
North Jersey Railway Co.	100	6,000,000	6,000,000	—	24 1/2 25
United Elec. Co. of New Jersey	100	504,000	504,000	11 1/2 % A.	22 24
Pittsburg, Pa. —Mar 25					
Allegheny Traction Co.	50	500,000	500,000	—	27 28
a Consolidated Traction Co. com.	50	15,000,000	15,000,000	2 % Jan.	24 1/2 25
a Consolidated Traction Co. pfd.	50	9,478,850	—	8 % Nov.	65 66
a Central Traction Co.	50	1,500,000	—	1 1/2 % Nov.	72 1/2 73
a Citizens' Traction Co.	50	8,000,000	—	6 % A.	72 1/2 73 1/2
a Duquesne Traction Co.	50	8,000,000	—	6 % A.	—
a Pittsburg Traction Co.	50	2,500,000	—	8 1/2 % Nov.	—
a Federal St. & Pleasant Valley Ry.	25	1,400,000	—	2 1/2 %	27 29
a Pgh., Allegheny & Man. Trac. Co.	50	8,000,000	—	2 % Aug.	—
a Pittsburg & Birmingham Trac. Ry.	25	1,800,000	—	1 % Oct.	—
a Pittsburg & West End Ry.	50	6,000,000	—	5 % A., June	41 42 1/2
United Traction Co. com.	50	17,000,000	—	J. & J.	15 15 1/2
United Traction Co. pref.	50	8,000,000	—	J. & J.	60 1/2 61

*Unlisted. †Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Rapid Transit Company.

e Stock owned by Kings County Traction Company; road operated by Brooklyn Hts. Co.

f Stock owned by Atlantic Ave. RR. and leased to Nassau Electric RR.

g \$200 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.

h Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

i \$75 per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company.

j A majority of stock owned by Chicago West Division Railway Company; 5 % on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.

k Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

*Unlisted. †Full paid. ‡Outstanding. §Ex div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Croton Railroad at 8 % on stock.

d Operating the former Met. Trac. system, the corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavyon Ferry—now Metropolitan Street Railway.

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1897, at \$215,000 per annum.

i Leased to Met. St. Ry. for 99 years from April 1, 1892; 6 % first 5 years, 8 % thereafter.

j Leased to Metropolitan Street Railway for \$145,000 per annum.

k Controlled by Third Avenue Railroad by purchase.

l Dividends of 1 1/2 % yearly guaranteed by Consolidated Traction Company.

m Controls by lease the Allegheny, Cent. Citizens' Duquesne, Fort Pitt & Pitt's Traction.

n Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

o Leased to Consolidated Traction Company for 6 % on \$8,000,000 capital stock.

p Leased to Consolidated Traction Company for 4 % on capital stock.

q Leased to Consolidated Traction Company for 7 % on capital stock.

TELEPHONE AND TELEGRAPH COS.

% Unlisted. † Paid in. ‡ Full paid. § Outstanding. ¶ Ex-div.
 a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6% on stock per annum.
 b Consolidation Electric, People's and Philadelphia Traction companies. Fixed
 charges and all indebtedness of constituent and leased companies assumed by Union
 Traction Company.
 c Practically all shares owned by Union Traction Company.
 d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
 e Leased to Electric Traction Company.
 f Controlled by Frankford & Southwark Passenger Railway.
 g Leased to People's Passenger Railway at \$5 per share.
 h Majority of stock owned by People's Traction Company.
 i Leased to Union Traction Company.
 j Lease transferred to Union Traction Company.
 k Leased to United Traction Company at a rental of \$10,000 per annum in 1886-7-8,
 & \$20,000 in 1899-1900 and \$30,000 per annum thereafter, payable semi-annually, rental
 declared as a dividend semi-annually.
 l Dividend of 10% guaranteed by Reading Traction Company.
 m Dividend of 6% guaranteed by Reading Traction Company.
 n Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

Pittsburg, Pa. - Mar 25					
Carborundum Mfg. Co.....	100	200,000	200,000		200
Standard Underground Cable Co..	100	1,000,000	1,000,000	Q	210
Miscellaneous. - Mar 25					
Barney & Smith Car Co.....com.	100	.....	1,000,000		18
Barney & Smith Car Co.....pfd.	100	.....	500,000	2 %	94
Hillings & Spencer Co.....	25	.....	.....		82
Consol. Car Heating Co.....	100	1,250,000	1,250,000	1 1/2 % Feb	106
Johns-Pratt Co.....	100	.....	.....		102
Pratt & Whitney Co.....com.	100	.....	.....		3
Pratt & Whitney Co.....pfd.	100	.....	.....		40
Hillwell-Bierce Co.....com.	100	.....	.....		50
Hillwell-Bierce Co.....pfd.	100	.....	.....	2 % Sept 1, '99.	50
Hulls Belting Co.....	100	500,000	.....		80
Charles Car Co.....	.....	.....	.....		80
Unlisted.					

ELECTRICITY.
BONDS.

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bid.	Asked.
	Authorized.	Issued.				
Albany N. Y.						
Date of Quotation—Mar 25, 1961						
The Albany Ry. Co.....Cons. mtg. 5s.	\$500,000	427,500	1940	J. & J.	118	119
The Albany Ry. Co.....Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*118½	.....
Watervliet Turnpike & RR. 1st mtg. 6s	850,000	850,000	1919	M. & N.	*125	.....
Watervliet Turnpike & RR. 2d mtg. 6s.	150,000	150,000	1919	M. & N.	*125½	127
Troy City Railway Co.....1st 5s	....	....	1942			

Interest guar. by Albany Ry. Co.
Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Mar 25, 1901

United Electric Ry. Co.....1st mtg. g. 4s.	88,000,000	18,000,000	1949	M. & S.	108	108 1/2
.....Income 4s.	14,000,000	....	1949	J. & D.	74 1/2	75
Baltimore City Pass. Ry. 1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118 1/2	119
Baltimore Traction Co.....1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120
Baltimore Trac. Co. Exten. & Imp. g. 5s.	1,250,000	1,250,000	1901	M. & S.	104 1/2	105 1/2
Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s.	1,750,000	1,750,000	1942	J. & D.	121	121 1/2
Bal. Trac. Co. Coll. Trust 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	101 1/2
Baltimore Traction Co. Convertible 5s.	800,000	....	1906	N. & M.	108 1/2	109
Central Pass. Ry. Co.....1st mtg. 5s.	96,000	117,000	1912	J. & J.	111	112
Central Pass. Ry. Co. Cons. mtg. g. 5s.	604,000	980,000	1922	M. & N.	119	121
Central & Suburban Ry. 1st mtg. g. 5s.	8,000,000	8,000,000	1922	J. & D.	116	117
Lake Roland Elev. 1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	118

All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Mar 25, 1901.

Lynn & Boston RR.....1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry.....Deben. g. 4 1/2s.	2,000,000	3,000,000	1902	M. & N.	104 1/2	106
West End Street Ry.....Deben. g. 4 1/2s.	2,000,000	2,000,000	1914	M. & S.	112	113

†\$1,074,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Mar 25, 1901.

Enterprise Street RR.....1st mtg. 5s.	500,000	47,000	1906	J. & J.	....	....
Charleston City Ry.....1st mtg. 5s.	850,000	....	....	J. & J.	106	....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—Mar 25, 1901.

Chicago City Ry.....1st mtg. 4 1/2s.	6,000,000	4,619,500	1901	J. & J.	101 1/2	102 1/2
Chicago Passenger Ry.....1st mtg. 5s.	400,000	400,000	1908	F. & A.	....	102
Chicago Passenger Ry.....Cons. mtg. 5s.	1,000,000	800,000	1929	J. & D.	....	....
Chicago & So. Side R. T.....1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	....	....
Chicago & So. Side R. T.....1st mtg. g. 5s.	1,800,000	750,000	1907	J. & J.	....	....
Chicago West Div. Ry.....1st mtg. 4 1/2s.	4,040,000	4,040,000	1922	J. & J.	108 1/2	109
Lake Street Elevated RR.....1st mtg. g. 5s.	7,974,000	8,781,200	1928	J. & J.	....	....
Metrop. W. Side Elev. Ry.....1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96 1/2
North Chicago St. RR.....1st mtg. 5s.	8,171,000	8,171,000	1906	J. & J.	106	....
North Chicago St. RR.....Cort. Indeb. 6s.	600,000	500,000	1911	J. & J.	....	....
North Chicago City Ry.....1st mtg. 5s.	800,000	500,000	1900	J. & J.	....	....
North Chicago City Ry.....consol. 4 1/2s.	2,500,000	2,500,000	1927	M. & N.	108	....
West Chicago St. RR.....1st mtg. 5s.	4,100,000	8,969,000	1928	M. & N.	....	....
West Chicago St. RR.....Deben. 6s.	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR.....Con. mtg. g. 5s.	12,500,000	6,000,000	1926	....	108 1/2	109
W. Chicago St. RR. Tunnel.....1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	....	....

†Redeemable at option on 60 da. notice.

†Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.

†Subject to call after Oct. 1, 1899, at \$110 and interest.

†Assumed by W. Chi. RR. Co., lessee.

†Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Mar 25, 1901.

Cin. New & Cov. St. Ry. 1st Con. mtg. g. 5s.	8,000,000	2,500,000	1922	J. & J.	114 1/2	115
Eden Pk In. 1st mtg. 5s.	45,000	45,000	1900	A. & O.	114	104
Eden Pk In. 1st mtg. 5s.	100,000	100,000	1905	A. & O.	114	....
Eden Pk In. Cons. mtg. 5s.	581,090	581,000	1906	M. & S.	108 1/2	109 1/2
Eden Pk In. Cons. mtg. 5s.	250,000	250,000	1912	M. & S.	121 1/2	122 1/2
Eden Pk In. Cons. mtg. 5s.	400,000	400,000	1922	J. & J.	182 1/2	187

†Assumed by the Cin. St. Ry. Co.

†\$500,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Mar 25, 1901.

Brooklyn Street RR. Co.....1st mtg. 5s.	600,000	600,000	1908	M. & S.	106 1/2	107
Cin. New & Cov. St. Ry. Cons. mtg. 5s.	8,000,000	2,500,000	1922	J. & J.	118 1/2	119 1/2
Cleveland City Ry. 1st mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	108 1/2	109
Cleveland Electric Ry. Co. 1st mtg. 5s.	2,000,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry. 1st mtg. g. 5s.	8,500,000	1,500,000	1918	M. & N.	....	....
East Cleveland RR.....1st mtg. 5s.	1,500,000	1,000,000	1910	M. & S.	107 1/2	108 1/2
Fl. Wayne (Ind.) Elec. Ry. 1st mtg. g. 5s.	1,000,000	1,000,000	1922	M. & N.	....	....
Lorain (O.) Street Ry. 1st mtg. 5s.	600,000	200,000	1915	J. & J.	....	....
St. Ry. Co. Grand Rapids.....1st mtg. 5s.	200,000	200,000	1912	J. & D.	....	....

†\$1,900,000 in escrow to retire bonds of absorbed companies, marked a.

†Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Mar 25, 1901

Detroit Citizens' St. Ry. 1st mtg. 5s.	7,000,000	8,885,000	1906	A. & O.	....	102 1/2
Fl. Wayne & Belle Isle Ry. 1st mtg. 5s.	400,000	877,000	1908	A. & O.	....	102 1/2
The Detroit Ry. 1st mtg. 5s.	1,800,000	1,800,000	1925	J. & D.	105	106 1/2

†\$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Mar 25, 1901.

New Haven St. Ry. 1st mtg. g. 5s.	600,000	600,000	1912	J. & D.	111	....
New Haven (Edgewood Div.) 1st mtg. 5s.	280,000	280,000	1914	J. & D.	111	....
Winchester Avenue RR.....1st mtg. g. 5s.	100,000	500,000	1912	M. & N.	109	....
Winchester Avenue RR.....Deben. g. 5	100,000	94,000	1922	M. & S.	....	....

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bid.	Asked.
	Authorized.	Issued.				
New Orleans La.						
Date of Quota Hen—Mar 25 1901.						
Canal & Claiborne RR.... cons mtg. 5s.	\$150,000	\$150,000	1912	M. & N.		
Oreocent City RR.....1st mtg. 5s.	.....	80,000	1899	M. & N.	105 1/2	.....
Oreocent City RR.....Cons. mtg. g. 5s.	5,000,000	8,000,000	1948	J. & J.		.....
New Orleans City RR.....1st mtg. 5s.	416,500	890,000	1906	J. & D.	108	112
N. Or's City & Lake RR..1st mtg. g. 5s.	5,000,000	2,599,500	1948	J. & J.	113	118
N. Orleans & Carrollton RR. 2d mtg. g. 5s.	890,000	890,000	1907	F. & A.		
Orleans Railroad Co.....Cons. mtg. 5s.	800,000	800,000	1912	J. & J.		
St. Charles St. RR. Co.....1st mtg. 5s.	800,000	75,000	1906	J. & D.		
†\$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.						
†\$90,000 outstanding.						

New York.

Date of Quotation—Mar 25, 1901.

Atlantic Ave. (Brooklyn).....Imp. g. 5s.	1,500,000	1,500,000	1904	J. & J.	95	....
Atlantic Ave. (Brooklyn).....1st gen. mtg. 5s.	759,000	759,000	1908	M. & S.	107 1/2	110
Atlantic Ave. (Brooklyn).....Cons. mtg. 5s.	8,000,000	1,966,000	1981	A. & O.	115	116
Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,850,000	1948	J. & D.	128	128 1/2
Bro'dway & 7th Ave. 1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105 1/2
Bro'dway & 7th Ave. 2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110 1/2
Bro'dway Surface.....1st mtg. 5s.	1,125,000	1,125,000	1924	....	115	117
Bro'dway Surface.....2d mtg. 5s.	1,000,000	1,000,000	1905	....	105	106
Brooklyn City RR. Co. 1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown.....1st mtg. 5s.	2,000,000	2,000,000	1899	J. & J.	115	116
Brooklyn Bath & W. E. RR. Gen. mtg. 5s.	1,000,000	448,000	1933	J. & J.	101	....
Brooklyn Heights RR.....1st mtg. 5s.	250,000	250,000	1941	A. & O.	104	....
Brooklyn, Q's Co. & Sub'n. 1st mtg. 5s.	8,500,000	8,500,000	1941	J. & J.	112	....
Brooklyn, Q's Co. & Sub'n. 1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	109	....
Brooklyn Rapid Transit.....gold 5s.	7,000,000	5,181,000	1945	....	109 1/2	....
Bleeker St. & Fulton Ferry RR. 1st mtg. 7s.	700,000	700,000	1900	....	98 1/2	100 1/2
Cent Pk. N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
Central Cross-town RR.....1st mtg. 5s.	250,000	250,000	1922	M. & N.	125	....
Coney Island & Brooklyn RR. 1st mtg. 5s.	800,000	800,000	1908	J. & J.	101	108
Dry Dock, E. B'd'y & B't'y R. gen. mtg. g. 5s.	1,000,000	980,000	1922	J. & D.	117	120
Eight Ave. RR. Co. Cort. Indeb. 5 1/2 %	100,000	1,100,000	1914	F. & A.	102	105
42d St., Man. & St. N. Av. 1st mtg. 5s.	200,000	1,200,000	1910	M. & S.	116 1/2	117
42d St., Man. & St. N. Av. 2d mtg. inc. 6s.	1,500,000	1,500,000	1915	J. & J.	124	125
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1928	M. & S.	130	132
Metropolitan St. Ry. Co. g. m. cl. tr. g. 5s.	12,500,000	12,500,000	1927	F. & A.	120	121
Second Avenue Ry. Gen. cons. mtg. 5s.	1,600,000	1,600,000	1909	M. & N.	128	129
Second Avenue Ry. Deb. 5s.	800,000	800,000	1909	J. & J.	118 1/2	119
Steinway Ry. (L. I.).....1st mtg. g. 5s.	1,500,000	1,500,000	1922	J. & J.	116	117 1/2
Third Ferry RR. Co. 1st mtg. 5s.	850,000	850,000	1919	....	110 1/2	112 1/2
Third Avenue RR.....1st mtg. g. 5s.	5,000,000	5,000,000	1927	J. & J.	....	128 1/2
Twenty-third Street Ry.....1st mtg. 5s.	150,000	150,000	1906	J. & J.	106	108
Twenty-third Street Ry.....Deb. 5s.	2,000,000	2,000,000	1942	F. & A.	118	119
Union (Huckleberry) Ry.....1st mtg. 5s.	500,000	500,000	1948	J. & J.	110	114

†\$1,085,000 in escrow to retire gen. mtg. bonds.

†\$4,850,000 in escrow to retire maturing obligations.

†\$552,000 in escrow to retire 1st and 2d mtg. bonds.

†In treasury, \$80,000.

†Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Mar 25, 1901

Montreal St. Ry. 1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
Toronto St. Ry. 1st mtg. g. 4 1/2s.	4,550,000	2,300,000	1921	M. & S.	....	....

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bld.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—Mar 25 1911						
Jefferson Avenue Ry.....1st mtg. 5s.	270,000	270,000	1905	M. & N.	162	118
Lindell Ry. Co.....1st mtg. 5s.	1,500,000	1,500,000	1911	F. & A.	167	168
Missouri RR. Co.....1st mtg. 5s.	1,000,000	700,000	1916	M. & S.	106	106
Mount City RR. Co.....1st mtg. 5s.	400,000	800,000	1910	A. & O.	104½	105½
People's RR. Co.....1st mtg. 5s.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 7s.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 5s.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric.....1st mtg. 5s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
St. Louis & Sub. Ry.....1st mtg. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5s.	800,000	800,000	.....	.....	80	84
St. Louis & Sub. Ry.....Cons. mtg. 5s.	500,000	500,000	1909	M. & N.	108	108
Southern Electric Ry.....Cons. mtg. 5s.	500,000	500,000	1918	J. & J.	116½	117½
Taylor Avenue St. Ry.....1st mtg. 5s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.....1st cons. mtg. 5s.	8,500,000	1,787,000	1918	J. & J.	121	122
Union Depot RR. Co.....Cons. mtg. 5s.	.....	.....	.....	.....	.....	.....
Controlled by St. Louis RR. Co.	.....	.....	.....	.....	.....	.....
Controlled by Union Depot RR. Co.	.....	.....	.....	.....	.....	.....
Controlled by Lindell RR. Co.	.....	.....	.....	.....	.....	.....
\$200,000 in escrow to retire 1st & 2d mtg.	.....	.....	.....	.....	.....	.....
\$500,000 in escrow.	.....	.....	.....	.....	.....	.....
\$200,000 in escrow to retire 1st mtg. bds.	.....	.....	.....	.....	.....	.....
San Francisco Cal.						
Date of Quotation—Mar 25 1901.						
California St. Cable RR.....1st mtg. 5s.	1,000,000	900,000	1915	J. & J.	114	117
Ferries & Cliff House Ry.....1st mtg. 5s.	650,000	650,000	1914	M. & S.	.....	117
Geary St., Park & Ocean RR.....1st mtg. 5s.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. 5s.	8,000,000	8,000,000	1918	J. & J.	126½	.....
Metropolitan Ry. Co.....1st mtg. 5s.	200,000	.....	.....	.....	.....	.....
Omnibus Cable Co.....1st mtg. 5s.	2,000,000	2,000,000	1918	A. & O.	126½	.....
Park & Cliff House RR.....1st mtg. 5s.	850,000	850,000	1912	J. & J.	105½	107
Park & Ocean RR.....1st mtg. 5s.	250,000	250,000	1914	J. & J.	115	.....
Park & Ocean RR.....1st mtg. 5s.	700,000	700,000	1912	M. & S.	.....	125
Powell St. Ry.....1st mtg. 5s.	1,000,000	900,000	1918	M. & N.	.....	.....
Sutter St. Ry. Co.....1st mtg. 5s.	.....	.....	.....	.....	.....	.....
Controlled by Market St. Ry. Co.	.....	.....	.....	.....	.....	.....
Washington D. C.						
Date of Quotation—Mar 25, 1901						
Belt Ry. Co.....Cons. mtg. 5s.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 5s.	500,000	500,000	1914	A. & O.	182	.....
Edgington & Soldiers' Home, 1st mtg. 5s.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 5s.	500,000	500,000	1901	J. & J.	.....	.....
\$50,000 in escrow to retire 1st mtg. bds.	.....	.....	.....	.....	.....	.....
Miscellaneous.						
Date of Quotation—Mar 25 1901						
Bridgeport Traction Co.....1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 5s.	5,000,000	8,548,000	1981	F. & A.	118	.....
Buffalo St. R. (Ind'polis). 1st cons. m. 5s.	4,000,000	8,000,000	1988	M. & N.	104	105
Chesapeake & Soldiers' Home, 1st mtg. 5s.	8,000,000	2,866,000	1982	M. & N.	112	118
Croftstown St. Ry. (Buffalo). 1st mtg. 5s.	8,000,000	2,261,000	1982	J. & J.	115	.....
Columbus (O.) St. Ry.....1st cons. g. 5s.	8,000,000	18,965,000	1988	J. & D.	111½	111½
Consolidated Traction (N. J.). 1st mtg. 5s.	15,000,000	572,000	1988	J. & D.	115	115½
Croftstown St. Ry. (Colu's). 1st mtg. 5s.	2,000,000	8,800,000	1920	J. & J.	20	.....
Denver City Cable Ry.....1st mtg. 5s.	4,000,000	922,000	1988	A. & O.	80	85
Denver City Tram Co.....Cons. m. g. 5s.	4,000,000	4,981,000	1980	J. & J.	119	119½
Louisville (Ky.) Ry.....1st cons. mtg. 5s.	6,000,000	4,050,000	1919	J. & J.	110½	110½
Minneapolis St. Ry. (N. J.). Cons. mtg. 5s.	8,000,000	2,878,000	1928	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.). 2d mtg. 5s.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.). Deb. 5s.	500,000	489,000	1902	F. & A.	.....	.....
No. Hudson Co. Ry. (N. J.). Cons. mtg. 5s.	1,250,000	1,000,000	1981	J. & D.	.....	.....
Paterson (N. J.) Ry.....1st mtg. 5s.	8,000,000	2,000,000	1980	A. & O.	.....	.....
Rochester (N. Y.) Ry.....1st mtg. 5s.	5,500,000	4,298,000	1987	.....	105½	106
St. Paul City Ry.....1st mtg. 5s.	1,000,000	1,000,000	1900	.....	108	.....
St. Paul City Ry.....Deb. g. 5s.	1,000,000	.....	.....	.....	.....	.....
\$1,000,000 in escrow to retire 1st and 2d mtg. bds.	.....	.....	.....	.....	.....	.....
\$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.	.....	.....	.....	.....	.....	.....
\$760,000 in escrow to retire bonds of C. St. RR. Co.	.....	.....	.....	.....	.....	.....
\$87,000 in treasury.	.....	.....	.....	.....	.....	.....
\$900,000 res'ed to redeem prior liens.	.....	.....	.....	.....	.....	.....
\$620,000 in escrow.	.....	.....	.....	.....	.....	.....

*With int'eres

ELECTRIC LIGHT AND ELECTRICAL MFG. CO'S

Boston, Mass.						
Date of Quotation—Mar 25 1901.						
Delaware Gas Lt. Co.....1st m. 5s. g.	800,000	800,000	.....	J. & J.	106	108
Edison Elec. Illuminating Co., Boston.....	2,026,000	.....	.....	Quar.	167	.....
General Electric Co., gold coup. deb. 5s.	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa.						
Date of Quotation—Mar 25, 1901						
Allegheny County Light Co.....5s.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co., Scrip 5s.	195,570	.....	.....	M. & S.	.....	.....
Miscellaneous. —(Mar 25 1901.)						
Edison El. Ilig. Co. (N. York) 1st m. 5s.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilig. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1998	.....	124	.....
Edison Elec. Ilig. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122½	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Pow. Co., 1st mtg. 5s.	2,500,000	.....	1987	A. & O.	100	105
Kings Co. El. Lt. & Pow. Co., 2d mtg. 5s.	5,176,000	.....	1997	A. & O.	120	122
Milwaukee El. Ry. & Lt. Co., 1st con. g. 5s.	8,000,000	.....	.....	F. & A.	102½	.....
United Elec. Light & Power Co. (N. Y.).....	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—Mar 25 1901.						
American Bell Telephone.....4s.	.....	.....	1908	F. & A.	100½	101
Northwestern Telegraph Co.....7s.	.....	.....	.....	.....	114	115
N. Y. & N. J. Telep & Telg. Co., gen. mtg. 5s.	.....	.....	1911	J. & D.	108	116
Chesapeake & Potomac Teleph. Co.....5s.	.....	.....	.....	.....	.....	.....

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—Mar 25 1901						
American Electric Heating.....7s	500,000	500,000	.....	.....	.....	25
Armington & Sims Engine Co.....5s.	.....	.....	1908	J. & J.	106	107
Barnes & Smith Car Co.....5s.	.....	.....	1904	J. & D.	115	127
Carborundum Mfg Co.....5s.	75,000	.....	.....	.....	.....	.....
Worthington Pump Co.....5s.	.....	.....	.....	.....	.....	.....
Called	.....	.....	.....	.....	.....	.....

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16¾c.; Lake, 16¼@16½c.; casting, 16½@16¾c.

The Rio Plate Electric Company of Philadelphia has increased its capital from \$100,000 to \$500,000.

The Metropolitan Street Railway directors have declared the regular 1½ per cent. quarterly dividend.

The Philadelphia Bell Telephone Company's capital stock has been increased from \$6,000,000 to \$8,000,000.

The Union Light, Heat and Power Company, of Covington, Ky., has been incorporated with \$1,500,000 capital.

The Consolidated Railway, Lighting and Refrigerating Company, capital, \$6,000,000, has been incorporated in New Jersey.

The Madison (N. Y.) Gas and Electric Company's annual meeting will be held April 17. Books close March 27 and reopen April 18.

Business failures in the United States last week numbered 224, against 183 the same week last year; in Canada there were 33, against 27 last year.

For February the Brooklyn Rapid Transit Company earned gross, \$843,394, and net \$258,932, gains, respectively compared with the like period last year, of \$26,112 and \$41,917.

The Montreal Heat, Light and Power Company is said to be organizing all the power, gas and electric companies in Montreal into a combination, with \$25,000,000 capital.

The following are quotations for some of the industrial stocks not quoted elsewhere: Electrical Lead Reduction, 5@5½; Electric Boat, 24@26; Electric Vehicle, 14@16.

The stock of Electric Lead Reduction is again an active feature of the outside market. The company announces that it is doing a very large business since the opening of its new plant at Niagara Falls.

Bell Telephone Company stockholders will again vote on an increase in the capital stock. A special meeting is called for May 21, the proposed increase being \$2,000,000, making the total outstanding \$8,000,000.

The Detroit, Ypsilanti, Ann Arbor & Jackson Electric Railway will give a mortgage on its property to the Detroit Trust Company for \$2,000,000 to secure bonds to pay for the extension from Ann Arbor to Jackson.

The Street Railway & Illuminating Properties of Boston has made a distribution of \$1 a share on its common stock. Including this recent payment the company has distributed \$6 on the common stock since January 1, 1901.

The committee on securities of the Baltimore Stock Exchange has recommended the listing of \$2,838,000 additional consolidated 4 per cent. bonds of the United Railways & Electric Company, making the total amount listed to date \$25,231,000.

The directors of the Erie Telephone Company at their meeting on March 25, in Boston, deferred dividend action pending the examination of the company's books by the Eastern Audit Company. Three months ago a regular quarterly dividend of 1½ per cent. was declared.

The Consolidated Traction Company of Pittsburg reports for February: Gross earnings, \$205,432; increased, \$10,603; net earnings, \$98,321; increased, \$8,340. From April 1 to February 28: Gross earnings, \$2,650,959; increased, \$254,331; net earnings, \$1,423,565; increased, \$210,601.

A resolution has been passed by the members of the New York Stock Exchange requesting the Government Committee to close the Exchange on Good Friday and the Saturday following. The Governors will probably take action in the matter to-day. It is believed they will grant the request.

Notices were issued Saturday for the annual meeting of the Electric Company of America to be held April 23. It is said that the profits of the year's business show about \$410,000. The year's dividend, \$1 per share, is on nearly 400,000 shares outstanding and the surplus over the dividend in 1900 is understood to be about \$20,000.

At a special meeting of stockholders of the Worcester Traction Company of Massachusetts, held on the 22d inst. at the office of Thomas C. Barr, 196 Market street, Newark, N. J., the representatives of \$3,834,000 out of a total of 5,000,000 shares voted to ratify a contract of sale entered into by the board of directors with Vermilye & Co., of New York. By this ratification the sale goes into effect at once. The price paid is kept secret.

Application has been made to list the stocks of the Canadian General Electric Company on the Montreal Stock Exchange. The capitalization of the company is \$1,500,000, of which \$300,000 is preferred, paying 6 per cent. interest. The common stock pays 10 per cent. per annum and the closing quotation in Toronto a few days ago, and where the stock has been active for some time, was 210¼. The capitalization will be increased to \$2,000,000. Last year the company paid out in dividends \$127,623.

Plans for the consolidation of the Boston electric lighting companies, which have been kept in abeyance since the failure of the effort of J. P. Morgan & Co., to effect a combination by the formation of a new company which was to absorb the Boston Electric Light Company and the Edison Electric Illuminating Company, are now maturing. As far as they extend at present, the plans contemplate a consolidation in which the stock of the Edison Company will be used as a basis for valuation. No outside capital will be required and the anti-trust statute will be complied with. It is expected that the gas and electric light commissioners will approve the terms of the consolidation and an additional issue of stock for the new corporation.

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EDITORIAL NOTES.

The Office of Commissioner of Patents.

The appointment of Mr. Fred. J. Allen as Commissioner of Patents in place of Charles H. Duell has caused the independent telephone men to rise up in arms, and it would seem justly so. Mr. Allen is from Auburn, N. Y., and is a director of the Empire Telephone Company of that city, which is a Bell Company, and it is a well-known fact that the Bell Telephone people have long wanted a man in the Patent Office who understands the telephone business, and who is friendly to them. Such being the case, is it any wonder that the independent companies do not approve of the present state of affairs, especially in view of the fact that the Bell Telephone Company has numerous complicated patent claims pending, and about to come before the Patent Office. Mr. S. P. Sheerin, Secretary of the Independent Telephone Association of the United States, declared recently that the members of the association and all others interested in independent telephone extension will protest against the appointment. He stated that the independent companies had no candidate, but they hold that they have a right to insist that a fair and impartial man shall get the place.

It is understood to be the intention of the Independent Telephone Association to ask the President to withdraw the appointment, and if this is not done, the gentlemen interested will fight confirmation in the Senate. In view of the facts of the case it is to be hoped that President McKinley will reconsider his decision and ultimately appoint some one in no way interested in the telephone warfare now being waged.

Compressed Air Cars.

The authorities of New York City are very particular as to the storing of acetylene, dynamite or other explosives within the city limits, and yet it sees no harm in a system of street railway propulsion, each car of which is a veritable charged mine in itself. Early on the morning of March 27 the tank on one of the compressed air cars on the Twenty-eighth street cross town line exploded, scattering bolts, rivets, scraps of iron and glass in every direction. That no one was seriously injured or killed outright was due to

the early hour and to the fact that the car had completed its trip and was about to enter the power house.

The cause of the accident is stated to have been due to a small steam pipe running through the heater. This pipe, which passes along the bottom of the heater, to which it is secured by studs, carries live steam which heats the water. This small steam pipe worked loose from the studs, and in the course of time wore the bottom of the heater thin by its continual chafing and grinding. This naturally weakened the wall of the heater, which eventually gave way, causing the explosion.

As repeatedly urged in these columns it is time this system of street railway propulsion was done away with in this city. The system in itself is bad enough, filling the streets as it does with a long line of grease and noise, and if added to this the tanks on the cars are going to explode occasionally, the sooner the Metropolitan Street Railway Company substitutes electricity the better. It is safe to say that had the compressed air tank on the car referred to exploded during the hours of heavy traffic there would have resulted many serious injuries if not loss of life. Why the Metropolitan Company persists in experimenting with this system of propulsion is difficult to see, for in an editorial some time ago we pointed out that the saving in operating expenses between the underground trolley system and the compressed air system would furnish ample funds to pay the interest on an amount of money sufficient for the construction of the conduit. Compressed air cars may be well adapted to suburban use, but they certainly do not meet with the approval of the public in this city.

* * *

The Manhattan-Staten Island Transit Scheme.

The Rapid Transit Commission, the latter part of last week, rejected Mr. Albert L. Johnson's proposal to construct a tunnel railroad from Manhattan through South Brooklyn and Staten Island to the New Jersey line, to be operated on a three cent fare basis. The ground on which the proposition was rejected was that it was too vague. It therefore seems reasonable to suppose that the matter will be brought up again on a different basis.

The interest in Mr. Johnson's proposed enterprise attaches to the three cent fares. He claims he can make money by hauling people at that price because there will be no water in

the stock of his road. That there is something in this is apparent to every one who has a knowledge of street railway finances and it is well known that the stocks of a corporation, which have no real value, must earn as much money as those which represent good dollars invested. As a daily paper puts it, "were it not for the liquid nature of so much corporate value, three cent fares would now be in vogue."

One cannot help but admire the enterprise and push of the two Johnsons. They have promoted, built and operated a number of street railways, not so much in the interest of the public, however, as in their own interests. The scheme now suggested eclipses anything heretofore accomplished by the two enterprising brothers, and is certainly a mammoth undertaking, and it therefore behooves the Rapid Transit Commission to look carefully into every detail, or in other words, make haste slowly. That the city needs rapid transit tunnels under the East River, and to Staten Island for that matter, is only too apparent, as was pointed out in a recent editorial, and unquestionably a three cent fare would be welcomed, but the Rapid Transit Commission should see that the city's interests are safeguarded in every way.

* * *

The Effect of X-Rays Upon Air. Prof. Emilio Villari has just discoursed before the Physical Society in London on "How Air Subjected to X-Rays Loses its Discharging Property and How it Discharges Electricity." He showed that air made active by X-rays in passing through a long tube coiled in many turns loses much more of its discharging power than it does in passing through the same tube if straight. During this process the tube charges itself to a certain potential. If active air is allowed to stream on masses of wire gauze or wound up ribbons, inclosed in tubes, the metals, independent of their nature, take a positive or negative charge according to whether the active air rubs against them with force or lightly. Experiments have been performed to prove this. For instance, tubes of copper or lead, if short and straight, take negative charges, but if long and coiled, they take positive charges. These phenomena cannot be attributed to chemical actions, but seem to be produced by a special rubbing to the active air upon metallic surfaces, as the result of which they assume one of the charges, and the other charge ought to manifest itself in the air. This is not the case, the charge of the air being often of the same kind as that of the metals. It has previously been shown by the author that active air by streaming against an electrified body is reduced either to ordinary air or to air charged with the electricity which disappears. Hence it may be supposed that the active air in rubbing upon the metallic surfaces develops the two electricities, one of which manifests itself upon these surfaces, and the other goes to reduce the active air to ordinary air and therefore does not become manifest. The electro-scope used in the experiments consisted of a fixed brass plate and a gold leaf whose position was determined by means of a telescope with an eye-piece scale.

Prof. Sylvanus P. Thompson, who presided, said that he had observed that metals were charged sometimes positively and sometimes negatively by active air.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

A CABLE dispatch states that Charles T. Yerkes has secured enough stock of the Metropolitan & District Underground Railway Company of London to prevent the installation of the Ganz high voltage motive system.

THE trouble between the employes and the Monongahela Street Railway Company of Pittsburg was amicably settled Saturday morning. The men passed resolutions, in which they agreed to drop all differences and blamed all their difficulty on outside interference.

LAST week the Supreme Court in the case of the State of Ohio vs. the Dayton Traction Company decided in favor of the traction company, affirming to such railway the right to carry freight through the streets of the municipalities along its lines.

FREDERICK J. ALLEN, of Auburn, N. Y., was sworn in as Commissioner of Patents on Saturday. After being sworn in Mr. Allen made the following statement: "The idea that I am in any way connected with the Bell Telephone Company is altogether without foundation. I am not now and never have been either an agent for or a stockholder in the Bell Telephone Company. I was at one time a stockholder and director of the Empire State Telephone Company, of Auburn, N. Y., which was a subsidiary branch of the Bell Company, but I have completely withdrawn from that concern. All my experience has been that stockholders and officers of these subsidiary companies are not likely to be friends of the Bell Company."

EXPERIMENTS with fast electric trains between Berlin and Hamburg, Germany, have demonstrated that a speed of at least 125 miles an hour can be attained without difficulty. Consul General Guenther, in Frankfurt, in a report to the State Department at Washington, on this subject, says that the high rate of speed has placed surface crossings out of the question. The outcome of the experiments is to be a line of 156 miles in length, from a point adjoining the city of Berlin to a station just outside of Hamburg. Its estimated cost is \$33,000,000.

EXPERIMENTS recently made abroad go to show that the insulating qualities of mica, which are used so extensively in electrical instruments, are materially affected by contact with oil. A sheet of mica spread over with a thin layer of oil loses about one-half its normal resistance to the passage of an electric current.

THE Ohio Independent Telephone Association will hold its annual meeting at the Chittenden Hotel, Columbus, on April 5. The principal object of the meeting, it is announced, will be to promote harmonious relations among the companies.

ACCORDING to official statistics, the United States now stands at the head of the world's exporting nations. The complete figures for the year 1900, when compared with the statistics of other nations, show that the exports of

domestic products were greater than those of any other country, the grand total being \$1,453,013,659. The total from the United Kingdom of Great Britain, which has hitherto led in the race for this distinction, is \$1,418,348,000, while the total for Germany is \$1,050,611,000.

NEARLY all of the street cars in Albany, Troy, Watervliet and Cohoes are now being operated by electricity generated by the Mechanicsville water power at the dam on the Hudson River. This is a great saving of expense over former methods.

DURING the past week the daily newspapers have contained sprightly articles about the latest incidents in the busy roles being daily enacted by Messrs. Nikola Tesla and Thomas A. Edison—but this time the movements of the gentlemen are outside the lines of pure science. The wonders wrought by a vegetarian diet induced Mr. Tesla to become a member of the Vegetarian Society of New York and he has written an article on the subject, an excerpt of which is as follows: "On general principles the raising of cattle as a means of providing food is objectionable. It is certainly preferable to raise vegetables, and I think, therefore, that vegetarianism is a commendable departure from the established barbarous habit." Mr. Edison, however, has been having real fun. A press dispatch from Fort Myers, Fla., states that on "Monday Mr. Edison went up the Caloosahatchie River with his family, chartering the steamer Suwanee. He caught forty-three black bass, the largest weighing eight pounds; killed a twelve-foot alligator; caught seven turtles and killed a quantity of duck, snipe, quail, wild turkey, white pelicans and kites. On Wednesday he went down the river, hooked three tarpon and caught eighty-seven fish. On Thursday a twenty-pound channel bass and a thirty-pound cavally, or snook amber jac, were among his large catch." Mr. Edison is due to arrive in New York to-day and will undoubtedly receive the plaudits of his friends for "his remarkable week's work."

At the recent meeting of the Council of the American Institute of Electrical Engineers the board selected the following ticket: President, Charles P. Steinmetz; vice-presidents, Samuel Sheldon, George F. Sever, M. I. Pupin; managers, J. W. Lieb, Jr., Samuel Reber, Charles F. Scott, W. E. Goldsborough; treasurer, George A. Hamilton; secretary, Ralph W. Pope. It was decided to raise the secretary's salary from \$2,500 to \$3,000 a year.

THE third annual meeting of the Southwestern Gas, Electric & Street Railway Association will be held at Houston, Tex., from April 19 to 22. The headquarters of the association are to be at the Rice Hotel. The usual reduction in railroad rates has been secured for members. Ten papers are to be presented at the meeting, as follows: "Municipal Ownership vs. Private Corporations," by T. D. Miller, of Dallas; "Association Between Meetings," by C. A. Newning, of Houston; "Station Work," by George Cushman, of San Antonio; "Corporations and Their Employes," by H. F. MacGregor, of Houston; "Street Railways of Texas," by F. E. Scovill, of Austin; "Inspection," by W. S. Rathell, of Waco; "Electrical Pot Pourri," by John G. Boyd, of Terrell; "What Are We Here For?" by E. L. Wells, of

Marshall; "Cheap Fuel and How to Use It Economically," by L. T. Fuller, of Colvert; "Water Power for Small Plants," by F. R. Starr, of Gonzales.

In a report to the State Department Consul General Guenther, at Frankfort, says: "It is reported that C. Petersen of Christiania has constructed a new incandescent lamp, which is of interest on account of its peculiar arrangement. For the radiation of light, a conductor of the second class, which conducts electricity only when heated, is used, the same as in the Nernst lamp. The conductor in this new lamp, however, is not a thread, but a small rod, which is brought to a white heat and thereby emits light. Around this 'second-class' conductor a thin metal wire of good conductivity is wound, which is connected with the current conductor by equalizing resistors, which serve the purpose of heating the second-class conductor and increasing the resistance of the current. The second-class conductor takes up the greater part of the current. This arrangement results in a great saving of the electric power, which about equals that of a Nernst lamp, but yields a considerably stronger light."

Americans interested in the promotion of English electric traction schemes will be glad to learn that the movement which has been set on foot for obtaining longer leases of lines from municipal authorities has borne good fruit, and the House of Commons has given its approval to the principle which allows a lease of something like 42 years instead of the much shorter periods with which promoters have had too often to be content. We may also add that there are signs that municipal opposition will not much longer be sufficient to throw out a scheme. Municipalities will have to sing small soon.

THE "Elektrotechnische Zeitschrift" for February 7 contains its yearly summary and full statistics of the electrically-driven tramways in Germany. On September 1, 1900, there were 99 towns having electric tramways against 88 on September 1, 1899. The total length of lines in the same time increased from 2,048 km. to 2,868 km., the length of track from 2,812 km. to 4,255 km., the number of motor cars from 4,504 to 5,991, the number of trailers from 3,138 to 3,962; the total capacity of generating plant from 52,509 kw. to 75,608 kw., and the total capacity of power house batteries from 13,532 kw. to 16,890 kw. Besides, at the commencement of September, 1900, 28 other towns had electric tramways in progress or definitely decided, with 821 km. of line and 1,053 km. of track. Of these 8 had been completed by January 1, 1901.

Those who are acquainted with what electrical science has achieved can form some idea of what it is still capable of accomplishing, says "Electrical Investments," London. The president of the Institute of Electrical Engineers, reminds us that "twenty years ago some of us were laughed at for our optimism, and yet everything that we declared then to be doable has now actually been done by engineers, except . . . the electric consumption of coal." But the industry has in this country been hampered by the solicitude which has been shown for local authorities, and they have exercised their power of veto in a way calculated to discourage private enterprise. The advance

made in recent years, since the adverse conditions have in a small degree been modified, has been wonderful. The capital invested in electrical undertakings exceeds £123,000,000, and of this nearly one-half represents lighting and traction investments made during the last ten years. At present new electrical investments are made at the rate of at least £10,000,000 per annum.

A CABLEGRAM from Port Said, Egypt, states that the Ophir, with the Duke and Duchess of Cornwall and York on board, arrived there on March 30. Mohammed Ali, brother of the Khedive, welcomed the English notables in the name of the Khedive. During the voyage the Ophir was almost constantly in touch with the shore by means of wireless telegraphy. On March 28 she sent a message to the Island of Malta, 185 miles distant, and passing 100 miles south of the Island of Crete, the Duke of Cornwall and York telegraphed to his cousin, Prince George of Greece, the Commissioner of the Powers on that island, and received a reply.

THE illumination of the Falls of the Rhine at Newhausen has for several years been a widely advertised attraction. It lasts for but a few minutes each evening and the effect of colored lights and searchlights is very beautiful. The guest of the hotel finds in his bill on departure a certain sum "for illumination of the falls." The Michigan Central Railroad, says the "Railway and Engineering Review," is proposing during the coming summer to illuminate Niagara Falls, which will afford a view of the greatest grandeur. A test recently made by officials of the passenger department with an electric searchlight convinced them that marvelous effects could be secured. Accordingly arrangements have been made for several similar searchlights to be erected on the high banks overlooking the falls from the Canadian side. The electric power is derived from the rapids, and the illumination will take place during the passage of all trains after nightfall. The most superb view will be from Falls View Station, where sufficient stops will always be made to allow the passengers to fully enjoy it. As no extra charge will be made this should prove a great attraction to travel by the M. C. Even those to whom the falls have become an old story, will find the night view a scene long to be remembered.

A RECENT German patent describes "the Dile apparatus" for the production of phosphorus by the action of a current on a mixture of phosphoric acid mixed intimately with one-fourth of its weight of carbon in the form of lamp black. The positive electrode is at the bottom of a covered cylindrical vessel, while the negative passes through a hole in the cover and can be lowered or raised by a screw. It is claimed that the apparatus will work continuously without the necessity of cleaning out the residue, as only carbonic acid, phosphorus and a small amount of light ash will be obtained, the raw material being introduced through a hopper at the top.

EXTENSIVE improvements have been made to the brickyard of Bartlett Brothers, just north of Hudson, N. Y. The most striking improvement will be the adoption of electricity as motive power. A twenty-five horse power motor for each machine has been ordered, a motor to pump the water from the river and an

electric locomotive with trolley is to be used on the tramway. This will do away with all horses on the yard and greatly facilitate the work. Ten arc lamps have been contracted for, and the yard will be lighted by electricity. This change will make it possible to load 150,000 brick a day, and will greatly aid in the productive power of the plant, which will be the only brickyard of its size in the country where the bricks are made by electricity. The power will be furnished by the Albany and Hudson Power Company, which operates the electric railway between those two places.

TOM JOHNSON, the "Trolley King," was elected Mayor of Cleveland, O., on Monday.

A SPECIAL cable from London, Eng., states that "Hon. William Mulock, Postmaster-General of Canada, gave evidence (on March 26) before the Inter-Departmental Cable Committee. The proceedings were private, but it is understood that Mr. Mulock favored the expansion of the state-owned cable system by the construction of a Government cable between Canada and Great Britain, also the acquisition of a line from Australia via Singapore and Hong Kong. The latter extension would be the greatest possible advantage to Canada, as thereby Canada would via a Pacific cable, be in direct communication with China and Japan, to the great advantage of Canadians seeking trade development in the Orient."

At Albany on April 1 Assemblyman Lynn explained the objects of his street railroad bill. He said: "It has no specific object. It is a bill with a general purpose, that purpose is to give electric railroad companies everywhere in the State an opportunity to compete with steam railroad companies. If the members from New York City are so afraid that the bill has some deep-laid purpose to acquire particular property in New York, they can leave New York city out of the bill. It will be just as acceptable to me with New York left out of it."

It is not in this country alone that the electrical industry is making remarkable strides. While the United States leads in this branch of business enterprise, others are following us closely. Great Britain, for example, has made a record which if it stood entirely alone would be fairly startling. It is only when it is brought into comparison with what has been done in the same direction here that it ceases to be wonderful. The capital invested in electrical enterprises in the United Kingdom, exclusive of the Government's telegraph and telephone systems, amounts in round numbers to over \$600,000,000. The increase in the last year has been over \$85,000,000, and in the last five years the amount invested has just doubled. These figures include the amount invested in plants used exclusively in the manufacture of electrical supplies. Another indication that progress will be still more rapid in the future is that there has been a very satisfactory reduction in the cost of production. The average cost of generation has decreased in five years nearly 50 per cent. The use of electricity is steadily growing in popular favor. In the last five years the number of 8 cp. lamps has increased from 2,000,000 to 7,660,000, and the units of light sold have increased from 30,000,000 to 125,000,000.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 21.

THE TELEPHONE AND TELEPHONE PRACTICE.

(Continued.)

The apparatus and circuits involved in the operation of telephones and central exchanges have undergone continual changes and improvements until at the present time the switchboards and circuits of up-to-date central offices have no resemblance to the ones used a few years ago. I will not attempt a description of all the different types of instruments and switchboards leading up to the present very complete common battery systems, but rather treat our series of articles on telephony under the following heads: Local Battery Systems, Line and Underground Construction, Common Battery Systems, Private and Interior Telephone Systems, Operation of Sub-Exchanges, Some Modern Circuits, and the Telephone Inspector.

LOCAL BATTERY SYSTEMS.

This is sometimes termed general system work and refers to the operation of instruments by separate batteries for each telephone. This was almost universally used, but at present is being gradually replaced by common battery or centralized energy systems.

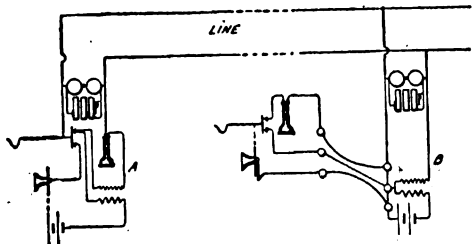


FIG. 1.

The Blake transmitter, described in the previous article, makes a very satisfactory equipment for what is known as ground lines, that is, where the earth constitutes one-half of the entire circuit, but metallic circuit work has been replaced by the granular carbon transmitter, sometimes known as the, "solid back." The granular carbon transmitter, instead of having a contact which is varied in pressure, as in the Blake, has a cell of fine granulated carbon inclosed at the ends by two carbon disks, one of which is placed solid while the other may act as the diaphragm itself or is attached to a diaphragm. The vibrations vary the pressure with which the granules lie against each other and cause a great variation of resistance to a flow of current through the cell.

Fig. 1 illustrates a circuit of two local battery telephones, showing all the connections. Set A describes the connections for a wall telephone and set B the connections for a desk instrument. In this circuit the polarized bell and magneto generator for signaling is shown as bridged on the line, and this is the more common method of connection, although the generator and bell may be placed in series with the line and be arranged to be cut out of circuit by the automatic hook. This latter arrangement would be all right provided there were just two telephones on a circuit, but if a

number of instruments were placed on one circuit it would give very unsatisfactory results, as the line would be unbalanced in resistance and also all conversations carried on between telephones, having other stations in the circuit, would meet with the resistance and impedance of the bell coils, which would be a serious detriment. On account of this most all telephones are now manufactured to operate bridged, on a circuit, and have polarized bells wound from 500 to 1,000 ohms resistance.

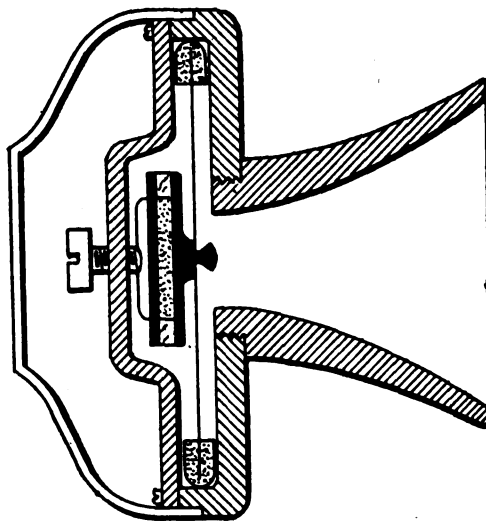


FIG. 2.

There are a large number of granular carbon transmitters on the market, but a very satisfactory one can be constructed as described in Fig. 2. The diaphragm is of sheet aluminum, $2\frac{1}{2}$ inches in diameter and 1-32 of an inch thick, surrounded by a heavy rubber band, as described in the drawing. The cell consists of two polished carbon disks $1\frac{1}{2}$ inches in diameter and 1-16 of an inch thick, separated by a ring of soft vibratory material, such as felt, $\frac{1}{4}$ of an inch thick having an outside diameter of $1\frac{1}{2}$ inches and an inside diameter of $\frac{1}{2}$ of an inch, forming a cell $\frac{1}{2}$ of an inch in diameter and $\frac{1}{4}$ of an inch deep. This cell should be filled with granulated carbon about as fine as coarse granulated sugar. The carbon disks should be copper coated on one side to permit of their being soldered to proper supports, such as small brass buttons, so that the diaphragm may be attached, and also for the adjusting screw to rest against. By having a hollow in the brass button attached to the back disk, the adjusting screw will then act as a support for the cell. In forming the cell, the felt ring may be glued to one of the disks to hold it in place. Two cells of battery give good results in the operation of a transmitter such as just described.

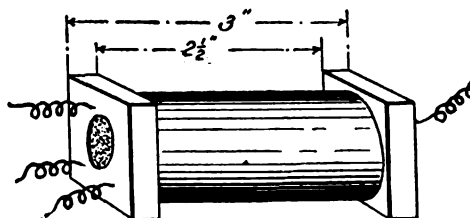


FIG. 3.

The following are dimensions for an induction coil (Fig. 3.) to be used with granular carbon transmitters. In fact it is a standard and may be used with most any make of transmitter with satisfactory results in general system metallic circuit work: Entire length 3 inches with end blocks one inch square by $\frac{1}{4}$ of an inch thick. The core of soft iron wire to be 5-16 of

an inch in diameter and to be the entire length of the coil. The primary winding consists of three layers of No. 25 magnet wound wire, B. & S. gauge, and the secondary winding to be ten layers of No. 28 magnet wound wire, closely wound over the primary.

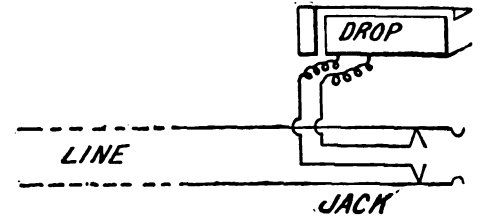


FIG. 4.

Any standard well made receiver may be used and they usually have from 75 to 80 ohms resistance in the coil. Apparatus, such as just described, if properly constructed, and adjusted, will make a good long distance telephone equipment, giving perfect results.

Fig. 4 described a circuit for a line connection to a central exchange showing the "jack" and "drop." This is the circuit almost invariably used except in multiple switchboards, where the line may be placed in series through all the jacks on its circuit or else the "drop" may remain permanently bridged across the circuit and a special restoring device used.

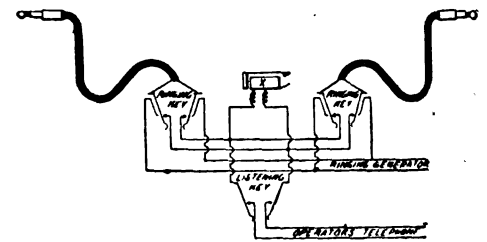


FIG. 5.

Fig. 5 shows a connecting cord circuit for a central switchboard, giving the circuit for ringing keys and listening key for the operator, also the clearing out signal sometimes called the "ring off drop." There may be any number of these cord circuits placed in a board by having the operator's listening circuit connected to all the listening keys. The operation consists of placing one "plug" in the jack of the station calling and placing the corresponding "plug" in the jack of the station called. When the subscribers are through talking they "ring off" which operates the drop X, indicating to the operator that the parties connected by that pair of cords have finished.

Article No. 22 will be entitled "The Telephone and Telephone Practice" (continued).

Gas Engines at High Altitudes.

Trouble with gas and gasoline engines working at high altitudes has prompted an item in the "Gas-Engine Magazine" to the effect that, as ordinarily sent out, such engines have air inlets too small and compression spaces too large for satisfactory work in a rarified atmosphere. In other words, when an engine is intended for high altitudes it should have a larger air-inlet and a smaller compression space than when the same engine is to work at sea level. It is hardly worth while to make these changes for altitudes of less than 5,000 feet, but for that altitude, and for those that exceed it, the engine should have a plate attached either to the piston or to the cylinder head in order to reduce the compression space. It should also be remembered that gasoline at high altitudes evaporates at a much lower temperature than at the sea level, and it would be well, therefore, to use the heavier grades.

WIRELESS TELEGRAPHY.*

BY PROF. DR. F. BRAUN.

During the winter I have delivered two lectures before Strassburg scientific societies on a part of my practical and scientific experiments in wireless telegraphy, and I take the liberty of giving a short account of the substance of these lectures. My experiments were commenced in the summer of 1898, and were at first devoted to methods of signaling through water in a more effective manner than hitherto. This, however, will be referred to on another occasion.

Following these, experiments on the Marconi system were undertaken with a view, in the first instance, to increase the action of the transmitter. At that time the general idea, and also Marconi's, was that he was working with Hertzian—i. e., with relatively short waves. In fact, the introduction of the Righi oscillator was manifestly with the intention of increasing the frequency of the waves as much as possible. One might be doubtful, however, to what extent this assumption was correct, for the question here was obviously to what distance the charge had already traveled in the transmitting wire connected to the Righi balls at the moment when the balls themselves are charged up to the sparking potential. If one takes the simpler connection with only one spark-gap the natural conception would be that the whole transmitter would be charged to practically constant potential owing to the slow charging process, and that it would thus behave as a Hertz oscillator; this assumption alone would explain the fact that the effects at a distance increased with an increasing length of transmitting wire. But, if these views were correct, Marconi's transmitting arrangements were not favorable. Then, his transmitter has small capacity, and this cannot be increased so long as the transmitter remains open. But oscillations of this character die out very quickly, as one knew from numerous experiments; they are damped too quickly by the sparks, a fact which Hertz expressed in the form that if the length of the spark is to remain "active" a certain size must not be exceeded.

All these considerations led to arrangements in the following manner: Condensers with a capacity of about the order of the usual Leyden jars were charged singly or in combination to a high potential, and their discharges through appropriately dimensioned self-inductions were employed to feed the transmitter directly or indirectly. Here, for the first time, slower oscillations than Hertz's were undoubtedly employed, and the first question that occurred was whether a coherer with the ordinary connections—where it is embedded in a circuit which is closed in the geometrical sense—would still act sufficiently. Then, the usual idea, which seems to be supported by facts, was that the coherer only responds to very short waves, as only these would produce a potential difference between the two poles sufficient to break down the gap in the coherer. This view seems to be directly confirmed if one first considers the coherer entirely insulated and exposed to the electric waves; and, secondly, if one is certain that it does not follow the periodic currents, but the periodically varying potential difference.

Experiments with the Leyden jar discharges well defined in every respect gave a positive result. First, the conditions of the experiments were varied to a considerable extent, among the arrangements tested being the connections now employed by Slaby and Count Arco. Especially closely examined was an arrangement which I denote as inductive excitation of the transmitter, and to the description of which I will confine myself at present. It is characterized by the fact that one leaves the transmitter quite sparkless, and excites the oscillations in it by induction. The condensers discharge through a primary circuit, and this excites the oscillations in the lower spirally-wound end of the transmitter. The lower end of the latter remains insulated from the earth, and it follows that its assistance in increasing the action to a distance, which Marconi found to be the case with his connections, cannot be interpreted in the usual manner. As a matter of fact, the earth acts, it may be mentioned parenthetically, in causing the transmitter to take up a greater electromagnetic energy.

The advantages of my connections are as follows:

1. In the primary circuit a large amount of energy can be employed usefully; the action of the transmitter increases with the energy employed to a much greater extent than with the Marconi connections, and can be augmented by increasing the capacity of the condensers as well as by increasing the potential.

2. The oscillations of the transmitter are, as is known, hardly active physiologically, in spite of their high potential, and a danger from unintentional contact is therefore quite excluded.

3. Less attention need be paid to the insulation of the transmitter than in the case of electrostatic excitation.

4. The oscillations of the primary condenser circuit are slightly damped, as has been known for a long time (for instance, from the classical experiments of Feddersen). They excite in the sparkless transmitter waves which are still less damped. If, therefore, both are brought to resonance, they increase in the latter case to a very high amplitude.

5. Thus they fulfill the fundamental conditions necessary for electrical tuning between a transmitting and receiving apparatus. The region of useful rays of oscillations will at the same time be extraordinarily extended, as is particularly desirable for this purpose.

The first assertion is proved by the following table:

Primary current in the induction coil.	Relative Electromagnetic Energy in the Transmitter.	
	Marconi connection.	Inductive excitation.
2 amperes	8	26
2½ to 3 amperes	10	40
4 amperes	10	55
6 amperes	10	62

The table shows that the mean energy of the waves in the Marconi transmitter (in consequence of the spark) soon reaches its limit, while it increases considerably in the case of inductive excitation, and, further, that for the same energy expended in the primary, the latter system far surpasses the Marconi transmitter. The second and third claims scarcely need a proof. If, as I demonstrated in my lecture, one connects a Marconi transmitter to earth by means of a long damp thread, the apparatus refuses to work while the inductively

excited transmitter is hardly affected by such a connection. The two last claims follow from resonance experiments. That the waves of the transmitter serve perfectly for a tuned telegraphy will be shown at the conclusion of this article.

Experiments in the open air have demonstrated a superiority over the Marconi transmitter under all conditions. The first observations in Strassburg, in the summer of 1898, already proved this, when the sender and receiver were in sight of one another (partly) as well as when they were hidden from one another by obstacles. The tests were resumed at Easter, 1899, at Cuxhaven, and in the winter of 1899-1900 telegrams were sent to Cuxhaven (Kugelbake) from the small steamer *Silvana* of the North Sea line, in her journey to Helligoland. With a transmitting wire of 15 meters in height on the *Silvana*, and a receiving wire 29 meters high at Kugelbake, regular and perfect messages were received to a distance of 32 km., and signals could be distinguished at distances of 50 km. During the experiments in the autumn of 1900, between Cuxhaven and Helligoland (63 km.) with masts 29 and 31 meters in height respectively at the two stations, comparative tests were made. While with inductive excitation all the signals were received, of 450 transmitted with Marconi connections not a single one could be observed at the receiving station although the supply of energy was pushed to the extreme limits. The remaining conditions were strictly identical. The following table gives a comparison in which the figures referring to the Marconi transmitter are taken from official reports reprinted in the "Elektrotechnische Zeitschrift:"

	Distance of transmission (E.).		Height of mast.		Product of the height of the two masts (F.).	$\frac{E}{P} \times 10^{10}$
	km.	meters.	meters.	meters.		
Inductive charge method:						
<i>Silvana</i> —Kugelbake....	32	15	29	435	74	
<i>Elbe I</i> —Kugelbake....	32	30	29	870	37+	
Helligoland—Kugelbake		31	29	900	69	
Marconi transmitter:						
Borkum—Borkum Fire ship.....	32	40	38	1,520	21	
North American Navy...	18.5	18.5	39	536	25	

The last column in the table gives the distance over which signaling should be possible, calculated according to a well-known rule. On the significance of the rule and the assumptions under which it applies, see Hertz, "Wied. Ann.," Vol. 36, p. 1, 1888. Even if one does not take this rule literally, the summary above proves the undoubted superiority of the transmitting arrangement described. The distance attainable should be, from the present facts and material, two and a half to three times that by the Marconi transmitter, although the receiver employed in the experiments was less sensitive than Marconi's. The fact that large amounts of energy must be available in order to signal over considerable distances with low masts may of course be troublesome in some instances, but in many cases it will hardly come into consideration.

The connections have here been described in their simplest form; they can be varied in different ways and the energy of the transmitter thus increased. The extent of its applicability in radiating large amounts of energy, whether

*The product of the heights of the masts should be about proportional to the distance attainable.
 *The smaller figure is because the actual distance is much smaller than what would have been attainable.

*From the "Electrician," London.
 *The lectures were delivered November 16, 1900, and January 31, 1901, and notices of them appeared in the daily newspapers.

in the form of long or short waves, is not fully portrayed in the above article.

In conclusion, the experimental proof that the oscillations produced are slightly damped remains to be given. This was done by means of resonance experiments. It is known that the Hertz waves, which die away quickly, excite in the resonator its natural period of oscillation to a considerable extent, a phenomenon which at first led to the assumption that a Hertz oscillator, similar to the light of an incandescent body, received a continuous succession of vibrations, and to which the name of multiple resonance was later given. In distinction to this, the oscillations employed here show sharply pronounced resonance phenomena. In my lecture I showed discharges which made 10,000,000 complete oscillations per second, and thus approached closely to Hertz's. These had a visible effect on a distant wire circuit in which a Geissler tube was included, provided this circuit was in tune.

It would thus be possible to base on these discharges a tuned system of telegraphy. But resonance phenomena of this kind are not favorable for other reasons; they show, it is true, that good conditions are fulfilled in the transmitter, but the task still remains to construct a correspondingly good receiver.

The problem was, therefore, attacked in another manner. The object was, on the one hand, to tune the oscillating systems between narrow limits, and on the other to increase the receiver effects. This latter could be done in two ways. One way would be to make as great as possible the energy taken up by the receiver—a course which was not followed in this case. If one considers the energy taken up as a fixed quantity, it only remains to concentrate it on the receiving apparatus, so that the latter benefits by it as far as possible, exclusively. The arrangement then works as a lens, which does not increase the energy of the light but concentrates it. I confine myself here to mentioning experiments which I showed in my lecture. These demonstrated that the electric waves which pass the receiver can be concentrated 20 times or more. Then they can be made to act in the form of heat on a microphone contact or on a coherer of the most suitable form, and the latter may be placed in such a way that its action cannot fail whether it reacts with current or potential difference.

I further showed in the lecture the sharpness of the tuning. Very slight changes in the tuning immediately diminished the localized energy very considerably. As the energy only collects in the tuned parts, the other parts will refuse to act, and thus the problem of the so called multiplex telegraphy is solved in a very complete manner.

An Invention for Detecting Distant Thunderstorms.

An instrument to which considerable interest attaches has been devised and described by M. T. Tommasina. Its object is to detect distant thunderstorms. The apparatus consists essentially of a self-decohering carbon coherer placed in circuit with a dry cell and an ordinary telephone receiver. The grains of carbon are hermetically sealed in a glass tube attached to the telephone magnet, so as to lie horizontally when the receiver is placed to the ear. The impression produced on the observer is that of being transported into the neighborhood of the thunderstorm which might yet be

hidden below the horizon. To strengthen the effect the author used three copper "antennae," each 30 m. long. In this manner it was found possible to observe the development of a violent thunderstorm at a distance twelve hours before it broke loose at the observing station, which was situated on the Lago Maggiore. A distant rain is indicated by a rattling sound before a cloud is visible.—"Engineer," London.

THE OSMIUM LAMP.*

BY WILLIAM J. HAMMER.

During my stay in Vienna last October, through the courtesy of Director Gallia of the Auer Company, I was permitted to see several of the new "osmium" incandescent lamps burning, and although I was unable to secure full particulars about this new and interesting development I learned that the lamp, which is the invention of Dr. Auer von Welsbach, operates at an emf. of 25 volts and shows an efficiency of from .9 to 1 watt per candle. The three lamps which I saw in use were all connected in parallel and operated with key sockets, and differed but little in general appearance from an ordinary carbon filament lamp. The globe was somewhat longer than an ordinary 16 cp. lamp, and the filament, which was of the hairpin shape, was much longer. It must be used in a vertical position, owing to its flexibility. I was told that these lamps had a life under test of 700 to 800 hours. It will be interesting to learn to what extent the low voltage of the lamp and the rarity of the material used in its manufacture will effect its commercial application. It had been intended to show the osmium lamp at Paris before the close of the exhibition, but there was not sufficient time. "Osmium," which was discovered by Tennant in 1803, is a blue-white metallic element and is almost infusible. For a long time it was known only as a crystalline grainlike material, and when fused in the electric arc as a hard, brittle substance unfit to be worked. I was informed in Paris, where I first heard of this lamp, that the successful method of handling this material, which has always been most difficult to work with, was due to a large extent to Mr. Waldron Shapleigh, of the American Welsbach Company, which concern controls the patent rights for the United States. According to Engineer Scholz in his lecture before the German Incandescent Gas-light Company, on January 23, 1901, an osmium lamp after burning 1,500 hours was still intact, and had fallen off in candle-power but 12 per cent.

Its efficiency at starting was 1.45 watts per cp., and at the end of 1,500 hours was 1.7 watts. It is claimed that as long as the filament remains intact it can be renewed several times. While the present range of voltage for these pure osmium lamps is 25 to 50 volts, a number of filaments can be connected in series or multiple series for higher potentials, and it is proposed to increase the resistance by coating or uniting the osmium with certain oxides. Mr. Scholz refers to a test conducted upon 4-25 volt osmium lamps in series, and 4-100 volt carbon lamps in parallel. The osmium lamp showed a consumption of 0.96 amperes, and the carbon

*Abstract of paper on "Important European Electrical and Engineering Developments at the Close of the Nineteenth Century," presented at the 151st General Meeting of the American Institute of Electrical Engineers, New York, February 28, 1901.

lamp 2-40 amperes, the former effecting a saving of 60 per cent.

A 20 cp. osmium lamp run at 27 volts required 24 watts, and a 20 cp. carbon lamp required 68 watts, the former effecting a saving of 44 watts, or about 35 per cent.

The osmium lamp was much the coolest, by reason of its higher efficiency. I had hoped to be able to show you an osmium lamp this evening and give some fuller data, but was unable to do so. I have brought with me a number of the foreign types of Nernst lamps for your consideration. I have, also, several dicarbide of calcium lamps, which type have been manufactured to some extent abroad. They are the invention of Mr. Langhans, of Berlin, to whom I am indebted for them. It may interest some of our members to learn that the Allgemeine Elektrizitäts Gesellschaft of Berlin are now making all their carbon filament lamps without platinum leading-in wires, using, so I am informed, iron wire, the sealing being done in an atmosphere of carbon monoxide. The A. E. G. purchased the patent from Schott, the well-known glass manufacturer of Jena. I am told these lamps give out quickly, diminishing to a dull red. In London I found a company which has been formed for the purpose of "rejuvenating" incandescent lamps. The filaments which have gone off in efficiency and candle power are taken out of the globe and re-treated, the globe cleaned of its smoky deposit and the lamp resealed and re-exhausted. I did not learn just how the globes were to be cleaned or what the rejuvenation was to cost. There are also several lamps known as "watt" lamps being exploited in Europe. They have a high efficiency, and are very simple, and cheaply constructed, and have a life of perhaps 200 to 400 hours. They make no pretense of being long-burning, but rely upon their high efficiency and low first cost.

UTILIZATION OF "HIGH FURNACE" GASES AND BIG GAS ENGINES FOR ELECTRICAL PURPOSES.

The utilization of high furnace or blast gases marks an epoch, not only in the employment of engines of great power but in the supplying of gas a new field for the application of electrical machinery. It is estimated that a blast-furnace having a capacity of 100 tons of pig-iron per 24 hours, produces 7,000,000 cubic feet of gas daily, equivalent to 2,800 hp. If we deduct the power required to drive the furnace proper, there remains 2,000 hp., which, so far, have been entirely wasted, and which, it has been found, may be successfully utilized in gas engines, and it appears that only one-sixth to one-quarter as much gas is required as would be necessary, when burning the same gases under boilers for producing steam power, and furthermore enables us to dispense with costly boilers. Between 25 and 30 years ago it was customary to burn these gases at the top of the stack. They are even so burned to-day to some extent. They were thought to be too poor in quality, and too variable in composition; too full of dust, particularly metallic particles, tending to clog and injure the moving parts; too full of acid matter, and of too high a temperature to enable their use in gas engines; but means have been found by passing the gases on their way from the stack to the engine through pipes and dust pockets in which the particles settle, and through coke and water scrubbers and saw-dust, so that the temperature is lowered, and the gases sufficiently well cleaned. Even at the Friedenshütte Iron Works, which I visit-

ed in upper Silesia, they operated successfully with gas charged with 40 per cent. of zinc dust, which only required more purifiers. Although some analyses show the presence of sulphuric and phosphoric acids and chlorine, the alkalies and lime probably neutralize their effect, and there is no apparent corrosion. There is little trouble from variations in quality, and gas works well in a gas engine of a quality which ignites with difficulty under a boiler. The first application of the high furnace gas was made in February, 1895, at Wishaw Iron Works, near Glasgow, with a 20 hp. gas engine, which indicated 15 hp. when driven with these gases. During the same year high furnace gases were applied on an eight hp. engine at the Cockerill Iron Works at Seraing, Belgium, and at the Hörde Iron Works in Westphalia, Germany, where they were used in a 12 hp. engine. The first patent for the utilization of high furnace gases in gas engines was taken out the previous year, in May, 1894, by Mr. B. H. Thwaite of England. The high furnace gases are similar in quality to the forms of producer and power gas made by Dowson and other processes, and taken directly from the stack, contain as a rule about 27 per cent. of combustible gases, chiefly carbon monoxide, and a little marsh gas and hydrogen, the balance being mainly (about 57 per cent.) inert nitrogen. It is estimated that at the blast furnaces in England alone over 2,000,000 hp. is annually going to waste which might be utilized for electrical purposes. The gas engine industry is about 30 years old. During that time, one company, the Otto, has sold in England and Germany alone about 37,000 gas engines, approximating 500,000 hp. As indicating the development of the large gas engine industry, it is interesting to note that the Cockerill Company of Seraing, Belgium, and its licensees, has sold in less than a year 70 engines of the Delamare, Deboutteville & Cockerill system. This engine develops 650 hp. when employing high furnace gases. The engine cylinder is 4' 3" diameter by 4' 7" stroke. The diameter of the air cylinder is 5' 7" by 4' 7" stroke. The length of connecting rod, connecting two cylinders, is 14' 5", diameter 11.8". Tested without blowing cylinder, this engine showed 573 BHP., with a consumption of 123.7 cubic feet of gas per BHP. or with a mechanical efficiency of 72 per cent. and a thermal efficiency taking the BHP. of 20 per cent. With the blower connected, this engine showed 886 indicated hp. and 725 BHP., with a gas consumption of 101 cubic feet per BHP. hour and a thermal efficiency taking the indicated hp. of 31.5 per cent. Until recently the speed of these blowers has ranged from 50 to 60 strokes per minute. An ordinary gas engine runs at a speed of 100 to 150 revolutions per minute, according to its size, and giving its maximum efficiency at maximum speed. (According to Kennedy and others a gas engine at one-half load consumes 25 per cent. more gas than at full load). I saw recently at Falvelhütte in Upper Silesia, Germany, a plant equipped with Horbiger and Rogler valves, enabling these blowers, which in this case were operated by steam generated by furnace gas, to operate at a speed of 80 strokes per minute. There are several types of valves now on the market, which enables these blowers to be run at a speed, adapting them to be driven successfully by large gas engines.

An engine which I had the pleasure of seeing at the Cockerill Works at Seraing, Belgium, had been running steadily for over two

years, both night and day, operating with high furnace gas. Prof. Aimé Witz' test showed an average of 181 BHP., and it showed a mechanical efficiency of 85 per cent., and consumed 116.5 cubic feet of furnace gas per BHP. hour. The thermal efficiency taking the BHP. is 20 per cent. The speed is 105 revolutions per minute. The cylinder has a diameter of 31.5" by 39.3" stroke. The Friedenshütte Iron Works in Upper Silesia, at the time of my recent visit to the installation, consisted of two 200 hp. gas engines direct coupled to two direct current dynamos, and two 300 hp. gas engines direct coupled to two alternating current dynamos. The gas engines are of the Otto-Deutz type, driving Shuckert dynamos. They were supplying a couple of hundred arc lamps, and several thousand incandescent lamps, and electricity for power purposes. The total hp. was 1,000, and at the time of my visit this was being increased to 2,400 hp. The plant will be in operation shortly, consisting of six 300 hp. engines for power purposes, and three 200 hp. for lighting.

Engineering Education.

In his inaugural address before the Birmingham Local Section of the Institution of Electrical Engineers in England, Prof. Oliver Lodge expressed himself warmly in sympathy with the movement prominently identified with Prof. Perry, in favor of reforming mathematical teaching. Euclid himself was splendid, he said, so was his book, for its day and generation, and its purpose as a system of geometrical philosophy admirable; but it had had its day, and for elementary and popular purposes should cease to be. We were too busy, there was too much to learn nowadays, to have time to cross every river by ascending to its source and walking down the other side. Professional guides along the old river path still attempted to hide the bridges, because if they were too easily seen their occupation would be gone. But the bridges were there, and sooner or later even school boys would be permitted to make use of them, and enjoy the country on the other side, without spending all their days in a toilsome and deterrent mode of getting there over a route approved by the ancients. If there were any workers in engineering or any other branch of technology who affected to despise pure science, and said that its pursuit was needless, they were hardly worthy of notice—it must be affectation. It was to be heartily admitted that the enlarged experience, and the large-scale experiments rendered possible by the wealth of communities, who applied science to their own convenience, reacted with immense advantage on pure science itself. But those large-scale experiments were hardly like experiments proper. They should not readily be tampered with. Facts known to few with effort were science, but those same facts when known to all without effort were aesthetic. Meanwhile, the justification for all pure dry science lay essentially in its ultimately human bearings. If a subject could be proved to be never capable of any human influence or any relation to humanity, however developed it might become, then its pursuit would be rightly condemned. But such proof could never be given. Again and again had the most unlikely channels developed into fruitful streams.

A by-law to provide for the installation of an electric light plant for the town of Thesalon, Ont., will be submitted to the rate payers on May 6th next.

THE KODOLITSCHÉ ELECTRIC MACHINE TOOLS.

Translated for ELECTRICITY from "L'Étincelle Électrique," Paris, France.

Among the electrically operated machine tools which are so generally coming into use from day to day, in our work shops and shipyards, we believe the Kodolitsche machines may justly claim to be particularly worthy of our attention. Although they are of the first order as regards merit and enjoy a well deserved and immense reputation in foreign countries, they are unfortunately as yet very little known in France. We believe we are rendering a service to French manufacturers by bringing these tools to the attention of our readers.

M. de Kodolitsche, who is the director of the Lloyd Arsenal in Austria, has invented a large number of boring drills to meet all the varied requirements of all branches of industry, in fact his machines differ very little from each other except in the arrangement of details and in their size; as a whole they are all modifications of a single type, which we summarize in the following description.

An electric motor is supported in such a manner as to be able to take any desired position in space, by being mounted upon a revolvable vertical bearing which is supported on a horizontal axis, which can be placed in any part of the shop, according to the nature of the work, or mounted on a car specially constructed to make it more readily movable from place to place.

Motion is transmitted from the motor to the working tool by means of a telescopic shaft universally jointed to permit of the tool being turned in any desired direction. The tool itself may be fastened to the work by ordinary clamps or magnetically attached to the work by means of electro-magnets.

By such a simple construction the apparatus becomes quite easy to manipulate and it may be brought to bear on the most difficult and complicated work.

We will add that on account of the great constructive strength of this tool and the complete absence of any complicated or delicate parts, the Kodolitsch drills have a just title to be regarded by those best able to judge of them as being the most perfect of any that have been constructed up to the present time. With the small type fitted with a motor of 1 hp. holes can be drilled and reamed varying from 6 to 25 mm. in diameter.

The most powerful type carries a 3 hp. electric motor and it is capable of drilling, or of cutting threads in holes up to 90 mm. in diameter.

The electric motor is ordinarily constructed to be operated by a continuous current, but it can likewise be constructed for tri-phase currents.

The Kodolitsche electric riveting machines are constructed on an entirely new principle which is extremely ingenious.

The driving electric motor carries an electro-magnet around in its revolutions, and when current passes through this movable magnet it engages a metallic mass in some manner, which is placed in front of the electro-magnet and by means of a screw provided with a traveling nut the movement of this metallic mass results in operating the movable header of the riveter.

At the precise moment when the contact

with the rivet should take place the electromagnetic contact is automatically released, but the accumulated operative energy in the metallic mass is translated into a pressure upon the head of the riveter capable of producing the desired head on the rivet, whereupon the movable parts automatically replace themselves and the machine is ready to operate upon the next rivet.

Two types of riveters have been built. First, a fixed type giving the rivet head pressure of 70,000 kilograms and capable of heading rivets up to 32 mm. This type is mounted on a car and when operated in combination with a stationary or movable crane it becomes a very handy piece of apparatus, capable of heading 150 rivets per hour, provided the rivets are well placed in the holes. Second, a movable type with adjustable supports capable of permitting riveting to be done in all positions. This machine can head rivets of 25 mm. in diameter with a pressure of 30,000 kilograms at a rate of 150 per hour.

Two men are sufficient to operate this machine when provided with a helper to heat the rivets.

The useful results secured are very great, for the riveting is extremely perfect in all details. The expense incurred for power is quite small, being about four times less than that necessary to operate a pneumatic riveting machine capable of producing the same grade of work.

From their first appearance on the market these riveting machines have received hearty welcome from all those who are capable of judging of their merits and all are agreed that they fill a demand, and particularly the movable riveting machine; for outside of the advantages secured by an electric machine over a hydraulic or pneumatic riveter they are in construction unrivaled, which makes them a perfect machine.

ELECTRICAL MEASURING INSTRUMENTS.

It was some years after electric lighting was introduced before electrical measuring instruments were fixed at collieries at all, partly owing, says the "Colliery Guardian," London, to the desire of contractors to keep their prices down, and partly owing to the desire of colliery owners and managers to save money. It is probable that no portion of an electrical installation saves more money if properly put in than the measuring instruments. A proper series of amperemeters and voltmeters will tell a tale to the trained eye at a glance, that will in a very short time save many times their value, under certain conditions which are very apt to occur at collieries, and within certain limits it is difficult to err in the matter of having too many of them. Thus, in addition to the instruments on the switchboard in the engine house, at bank, a voltmeter and an amperemeter near the pit bottom, will give timely warning of injury to the shaft cables, and similar instruments at each station where a motor is used will not only give warning of any damage to the cables leading to the motor, but will also tell a continuous tale of the apparatus itself, of the motor, the pump, or haulage plant, or whatever the motor may be driving. But it must be remembered that the electrical measuring instrument can err like any other apparatus, and careful watch should be kept for signs of irregularities.

Electric measuring instruments are subject

to influences of their own, which tend to alter the value of the reading on their dials. Thus in some of the instruments which were made a few years ago continuous work altered their readings, especially with voltmeters, owing to the resistance of their wire coils increasing with the heat delivered to them by the passage of the currents themselves, which were used in measurement. In addition to sources of error of this kind, some instruments depend upon the strength of a permanent magnet for the value of their readings, and as all permanent magnets lose their magnetism with time, their readings alter in value. Also all instruments have some form of needle which swings over a dial, or something similar, and the pivots of this needle become partially clogged with dirt, dust which has penetrated into the instrument, notwithstanding the utmost care, also to rust, which has been created by moisture. These causes tend to lower the readings of the instruments, and are common to nearly all instruments, and may lead to machines being unduly strained in consequence.

The remedy is—compare the instruments with new ones purchased from time to time for the purpose, and in the case of voltmeters compare the pressure read off on the dial with that which should be given with a new incandescent lamp made by a well-known firm. A 16-candle power lamp is a very good standard of pressure, if of well-known make, and a little practice soon enables one to judge the color which the lamp should be when the pressure is at a certain figure. Also having such a standard for pressure, it is always possible to check the ampere readings approximately, near enough for practical work, by calculating the current that ought to be going out with a certain number of lamps burning at a certain pressure. If there appears to be considerable discrepancy the instruments should be compared with new or with any standard available. Instruments which have begun to read incorrectly need not necessarily be discarded. All that is wanted in industrial work is a knowledge of what is going on, and this may be obtained by applying a correction to the instrument.

LONDON NOTES.

(From our London Correspondent.)

Conduit and Trolley Traction.

A very full paper, entitled "Combined Trolley and Conduit Tramway Systems," was read on March 15 before the London Institution of Mechanical Engineers, the author being Mr. A. N. Connett. He discussed various systems, having in mind their application to central thoroughfares where municipal authorities are anxious not to employ overhead trolley wires.

The Electric Lighting of the City.

The annual report of the City of London Electric Lighting Company gives a very poor showing. Ordinary stockholders who a few years ago received 10 per cent. and 6 per cent. dividends have to go without a penny interest upon their capital invested for the year 1900. The business has gone ahead enormously, between eleven and twelve million units being sold for private lighting and about 540,000 8 cp. lamps being connected, but expensive litigation, the high price of coal and greatly reduced charges to consumers have brought the profit to a very low figure. The company

has the best area in London, but a combination of evils has brought about the present state of affairs, and the competition now being energetically pressed by the "live" Charing Cross Company renders the outlook anything but bright. When the chapter of causes of the failure comes to be written it will afford most interesting though doleful reading.

Steam Engines for Electrical Work.

The Manchester branch of the Institution of Electrical Engineers has just considered and discussed a paper by Mr. J. S. Raworth on "The Application of Steam Power to the Generation of Electrical Energy." Mr. Raworth pointed out the merits of English engines for electric traction, a class of work for which they are considered now to be especially well adapted.

NEW YORK ELECTRICAL SOCIETY.

Through the courtesy of the New York Electrical Vehicle Transportation Company, the New York Electrical Society held its 213th meeting at the new Main Station, Eighth avenue and 49th street, Wednesday, March 27. The Society was welcomed by Mr. Henry Sanderson, president of the company. The meeting was held in one of the upstairs departments, where Mr. George Herbert Condict, consulting engineer of the company, mounted on an automobile as a rostrum, delivered a brief practical address on automobile work in New York City, and gave various details with regard to the system. Mr. Condict stated that the company now had over 300 vehicles in operation, with capacity for at least 700, whereas only four years ago it had but twelve in operation. He attributed the great success and popularity obtained to the fact that when he himself was unable to reach New York from Philadelphia for three days, owing to the blizzard of 1899, and when none of the horse vehicles could ply the streets of New York, the electric automobiles were found able to plow their way through the snow drifts with comparative ease. "But for the performance of the electric automobiles on that memorable night," said Mr. Condict, "New York society would have been paralyzed, and even as it was, the vehicles were busy till late the next morning, carrying home society people who had been stalled at balls, theaters and private residences." Strangely enough, the New York Electrical Society visited the old stables of the company the same night, upon which occasion Mr. Condict was to have addressed it.

After Mr. Condict's remarks the whole of the vast building in all its departments was thrown open to the visitors, numbering between 300 and 400, who roamed about freely at will, watching the machinery in operation, and taking a particular interest in the ingenious methods and appliances by which the batteries were taken to and from the charging room and inserted into and removed from the vehicles in service. After this examination the company served coffee and other refreshments, and it was not until 11 o'clock that the members dispersed, the Society having scored another emphatic success in its plan of visiting electric installations so as to enable its members to see for themselves the processes and details of operation.

President Martin announced that on April 25, at Columbia University, Mr. Charles F. Scott, electrician of the Westinghouse Electric &

Manufacturing Company, would deliver a lecture, illustrated by apparatus and experiments, on "Alternating Current Motors." Mr. Scott's well-known ability as an inventor and his gift of clear exposition will render this one of the most valuable meetings held by the Society during its remarkably active and successful season, which, before it closes, will include one or two more very interesting evenings.

The Secretary requests us to announce that the striking lecture on "Systems of Electric Transmission and Distribution," delivered before the Society by Mr. C. P. Steinmetz, has been issued in a neat and handy pamphlet, octavo size, which can now be secured from him by direct application or by mail at 25 cents a copy. This is one of the best popular treatments of the alternating current now available, and requests for it are already such as to insure its wide circulation.

The following members were elected: E. H. Mullin, J. Lloyd Wayne and Franklin S. Holmes, all of New York City.

BOOKS RECEIVED.

MOODY'S MANUAL OF INDUSTRIAL AND MISCELLANEOUS SECURITIES. The O. C. Lewis Company, 6 Wall street, New York.

This work is bound in cloth and contains over 1,100 pages of matter, giving statistics and information relating to railway companies, power, lighting and automobile companies and miscellaneous concerns.

A TEXT BOOK OF MECHANICAL DRAWING AND ELEMENTARY MACHINE DESIGN. By JOHN S. REID and DAVID REID. Published by John Wiley & Sons, New York.

This work, which is handsomely gotten up, is fully illustrated and contains 380 pages of matter relating to machine design.

DYNAMO ELECTRIC MACHINERY. By SAMUEL SHELDON and HOBART MASON. Published by D. Van Nostrand Company, New York. Bound in cloth. Price \$2.50.

As the authors state this book, which is fully illustrated and contains some 280 pages of matter, is intended for the general reader as well as a book of reference for engineers.

ELECTRIC LIGHTING. By FRANCIS B. CROCKER. Published by D. Van Nostrand Company, New York. Bound in cloth. Price \$3.

This work, which contains some 500 pages of reading matter, is a practical exposition of the art of electric lighting for the use of engineers, students and others interested in the installation or operation of electrical plants. The work also contains much general information of value and is fully illustrated.

MODERN ELECTRIC RAILWAY MOTORS. By GEORGE T. HANCHETT. Published by the Street Railway Publishing Company, New York. Bound in cloth.

This work contains about 200 pages of interesting matter relating to railway motors. As the author states the object of the book is to show how electric railway motors are made to-day and why they are made so. The book is free from intricate mathematics and should be in the hands of all persons who have just entered or are about to enter active work in the electric railway field.

An act incorporating the London, Aylmer and North Shore Electric Railway, of Ontario, has passed the Railway Committee of the Ontario Legislature. This road will run from London, Ont., to Aylmer and Port Burwell. Capital stock is \$850,000.

MODEL HOTEL EQUIPMENTS.

In the model hotel or apartment house of to-day telephones are quite as necessary as the elevators and mail chutes. After many unfavorable experiences, architects, engineers and contractors have gradually discarded the cheap and inefficient telephone apparatus and are choosing more for quality and durability than price. For these reasons the New Hotel Essex at the northwest corner of 56th street and Madison avenue, New York City, is equipped with genuine Ericsson telephones



FIG. 1.

and switchboard, which give quick communication from every suite and hall to the office, and place the management within easy reach of every patron. The room telephones are all of the Hand Microtelephone pattern, as shown in Fig. 1, and instead of being a disfigurement to the wall, they serve as an ornament to the finely finished suites. Each of these is fitted with a flexible cord of sufficient length to enable the patron to call the office, or to answer a call if desired, without rising from the couch or bed. When through using, the releasing of a lever in the handle makes and breaks all necessary connections and it is not necessary to replace on a hook, as in ordinary

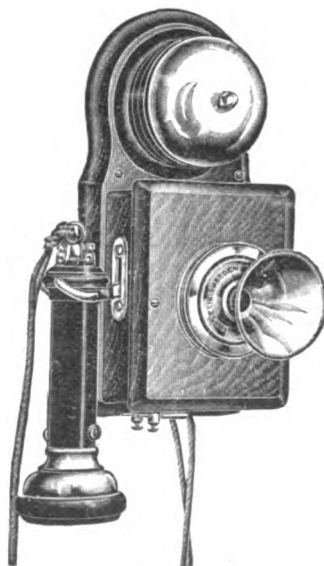


FIG. 2.

telephones. When first introduced, the Hand Microtelephone was considered a curiosity, but its utility and compactness has made it a great favorite, and it bids fair to soon take the place of the once popular nickel desk set, and in many

cases replace the wall instrument as well. In operation, the office is called by simply pressing the contact in the handle of the Hand Microtelephone, which act throws the drop at the switchboard. The operator connects in the usual manner, answering the call, and if desired calls some other suite and enables the two to converse. The call to the suite is made by a small musical gong placed near the ceiling, which, while loud enough to call a person, is not harsh enough to disturb one. As shown in Fig. 2 the wall telephone for use in the halls is neat, compact, and takes small space. It is fitted with the standard Ericsson receiver and transmitter, now so well known. In operation it is used in the usual way, the act of taking the receiver from the hook, sending the call for the operator in the office. With both instruments, when the line is released, the operator is at once notified and quickly disconnects. The switchboard is shown in Fig. 3, and besides being positive and rapid in operation, it is of the finest mechanical construction, is very durable, is handsomely finished, and while occupying very little space compared to its capacity, is of a peculiar design, which distinguishes it from ordinary boards. The system is operated by centralized batteries and is so

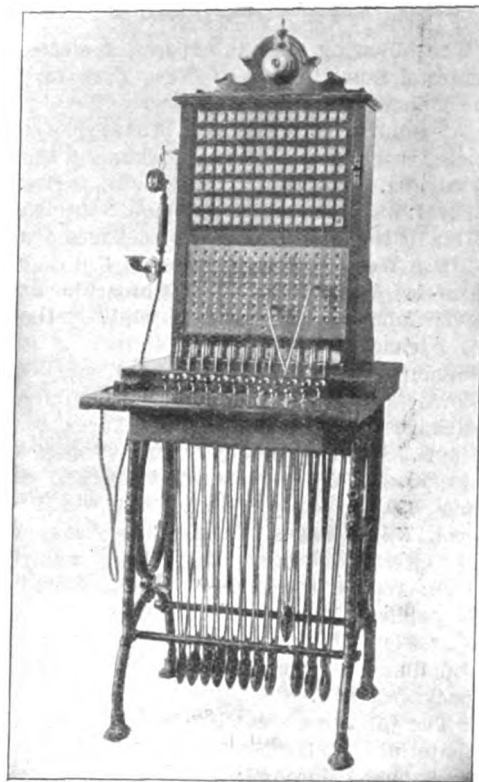


FIG. 3.

arranged that when desired a motor generator can be thrown into circuit for calling.

In addition to this system, the Ericsson Telephone Co., 296 Broadway, New York, makes a number of different systems and telephones of special design and finish for special uses, including intercommunicating patterns and for exchange use.

Proposals Invited.

The Treasury Department Supervising Architect will receive sealed proposals until 2 o'clock p. m. April 25 for the installation of an electric wiring system for the outbuildings of the U. S. Bureau of Engraving and Printing, Washington, D. C.

CANADIAN NOTES.

(From our Ottawa Correspondent.)

The town council of the town of Glace Bay, C. B., in the province of Nova Scotia, will likely install an electric light plant during the coming summer.

The Guelph Railway Company, of Guelph, Ont., has secured a charter to construct an electric railway to Hespeler, via Puslinch Lake, and also to Berlin, Ont.

The city council of Vancouver, B. C., has decided to grant a franchise to the Stave Lake Power Company to supply light and power within the city.

The Legislature of Nova Scotia will be asked to give the town of Yarmouth, N. S., authority to borrow \$10,000 for the purpose of installing an electric light plant to be operated and owned by the municipality.

Mr. J. M. Harris, of the Recco mine, Sandon, B. C., purposes establishing an electric light and power plant of 1,000 hp. at Three Forks, B. C.

A movement is now on foot to connect Bala, Port Carling and Bracebridge, Ont., by telephone.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended March 20:

Alexandria, 1 package, \$78; Antwerp, 6 cases motor carriages, \$997; 34 packages, \$3,285; Australia, 1 package, \$25; Brazil, 212 packages, \$14,137; 51 cases, \$4,797; Bremen, 3 packages, \$110; British East Indies, 19 packages, \$8,052; British West Indies, 57 cases, \$1,456; Central America, 670 packages, \$7,310; China, 9 packages \$322; Cuba, 96 cases \$7,286; Dutch West Indies, 23 packages, \$718; Frankfurt, 1 case, \$150; French Possessions in Africa, 94 cases, \$12,350; Genoa, 48 packages, \$16,255; Hamburg, 43, packages, \$5,044; Havre, 76 packages, \$5,375; Hayti, 58 packages, \$381; Japan, 49 cases, \$17,414; Korea, 66 cases, \$14,207; Lisbon, 30 packages, \$30,876; 54 electric cars, \$112,006; Liverpool, 758 packages, \$32,383; 3 packages auto vehicles, \$920; London, 24 packages motor vehicles and parts, \$6,000; 208 packages, \$10,563; Marseilles, 45 cases, \$2,702; Mexico, 798 packages, \$7,011; Newcastle, 4 packages, \$400; Newfoundland, 20 packages, \$586; Nova Scotia, 92 packages, \$865.

The following are the exports of electrical material from the port of New York, for the week ended March 27:

Alicante, 8 packages, \$1,347; Antwerp, 5 packages, \$384; Australia, 6 cases, \$314; Barcelona, 12 packages, \$573; Bournemouth, 1 case, \$700; Brazil, 14 packages, \$1,296; British East Indies, 19 packages, \$1,116; British Guiana, 4 packages, \$38; British Possessions in Africa, 2 cases electrical machinery, \$75; 110 packages, \$12,701; 3 cases motor vehicles, \$925; British West Indies, 9 packages, \$201; Central America, 13 packages, \$916; Chili, 9 packages, \$434; Christiana, 1 package, \$300; Copenhagen, 6 packages, \$90; Cuba, 175 packages, \$4,589; Ecuador, 5 packages, \$60; Genoa, 37 packages, \$3,672; Glasgow, 247 cases, \$36,256; 73 reels, electric cable, \$28,376; Hamburg, 83 packages, \$6,660; 87 cases, \$10,436; Leith, 3 packages, \$178; Liecester, 2 cases, \$230; Liverpool, 101 packages, \$12,869; London, 225 cases, \$9,906; 57 packages, \$4,404; 4 packages motor vehicles, \$1,930; Manchester, 1 package, \$375; Mexico,

30 cases, \$1,478; Milan, 6 cases, \$269; Naples, 2 cases, \$285; Newcastle, 90 packages, \$48,677; New Zealand, 1 package, \$28; Preston, 1 package, \$25; Peru, 15 cases, \$242; Rotterdam, 7 cases, \$74; Sheffield, 16 cases, \$2,000; Southampton, 1 case, \$500; 2 packages, \$101; St. Petersburg, 2 packages, \$150; U. S. Colombia, 205 cases, \$1,075; 2 reels cable, \$29; Venezuela, 139 cases, \$738; Zurich, 1 case, \$70.

PERSONAL MENTION.

Mr. J. B. Ware, formerly of Grand Rapids, Mich., has accepted the position as general manager of the People's Telephone Company of Detroit.

Mr. Sylvester B. French has been appointed manager of the New York & Pennsylvania Telephone & Telegraph Company for the district which embraces Elmira, Watkins, Horseheads and Troy.

Mr. Charles Armstrong, of Chicago, has been engaged to supervise the electrical exhibit of the Milwaukee, Wis., Industrial Exposition to be held next fall.

Mr. George W. Aldridge has accepted the position of general manager and overseer of the lighting interests of the Citizens' Light & Power Company in Rochester, N. Y., and other cities.

Mr. S. C. Cooper of this city has been elected assistant to Secretary W. T. Irwin of the Cincinnati (O.) Traction Company.

Mr. Clarke Merchant was recently elected president of the Schuylkill Traction Company of Philadelphia, Pa.

INCORPORATIONS.

The Amusement Electrical Company, Brooklyn, N. Y. Capital stock, \$4,000. Directors: G. W. Woods, H. C. Bolton and A. J. Moore, New York.

The Billerica Electric Company, Billerica, Mass. Capital stock, \$20,000. Officers: W. A. Dicuker, president; C. S. Cummings, second treasurer.

The Cooper Electric Light Company, Cooper, Tex. Capital stock, \$10,000. Incorporators: Charles Tuttle, William R. Evans and Ed. S. Kelley, of Kaufman, Tex.

The Emporia Railway, Lighting & Repository Company, New York City—to distribute electricity or any other motive, lighting or heating power. Capital stock, \$150,000.

The W. N. Thayer Company, New York City—to manufacture electrical machinery. Capital stock, \$5,000. Directors: W. N. Thayer and G. N. Warner, New York City; E. G. Bernard, Troy.

The Merritt & Lockwood Company, New York City—to deal in electrical goods. Capital stock, \$10,000. Directors: T. F. Merritt, New York City; E. F. Lockwood and Elizabeth M. Lockwood, Mount Vernon.

The Kero Arc Light Company, New York City—to manufacture lamps. Capital stock, \$300,000. Incorporators: Willard B. Mack, E. H. Fessenden and J. F. Place.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED MARCH 26, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

670,415. Electrically-Operated Brake. George D. Burton, Boston, Mass. Filed April 13, 1899. Renewed Aug. 13, 1900.

670,419-670,420. Railway-Brake. Anton Duppler, Jersey City, N. J., assignor, by direct and mesne assignments, to Phoebus H. Alexander, New York City, and the Compound Magnet Brake Company of New Jersey. Filed Oct. 17, 1900, June 12, 1900.

670,651. Electric Railway. William T. Van Dorn, Chicago, Ill. Filed April 27, 1900.

670,712. Trolley-Wheel. Robert Kuhn, Cincinnati, O. Filed Nov. 10, 1900.

670,855. Safety-Trolley Device. Charles W. Diamond, New Orleans, La., assignor to Moise Levy, Jr., same place. Filed July 18, 1900.

670,873. Railway-Brake. Alfred Green, Rochester, N. Y., assignor, by mesne assignments, to the Compound Magnet Brake Company of New Jersey. Filed March 1, 1901.

670,895. Unit-Multiple System of Electrical Train Control. Frederick C. Esmond, Brooklyn, N. Y., assignor to the Esmond Electric Traction & Signal Company of West Virginia. Filed Aug. 2, 1898.

670,898. Unit-Multiple System of Electric Railways. Frederick C. Esmond, Brooklyn, N. Y., assignor to the Es-

mond Electric Traction & Signal Company of West Virginia. Filed Aug. 2, 1898.

670,897-670,898. Unit-Multiple System of Train Control. Frederick C. Esmond, Brooklyn, N. Y., assignor to the Esmond Electric Traction & Signal Company of West Virginia. Filed Jan. 25, 1900, April 10, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

670,536. Shield and Reflector for Electric Lights. Thomas E. Clark and Richard Ernst, Detroit, Mich.; said Ernst assignor to said Clark. Filed June 23, 1900.

670,552. Handle and Adjuster for Electric Lights. Ellis E. Brown, Reading, Pa. Filed Oct. 16, 1900.

670,658. Electric-Arc Lamp. Edgar A. Beck, Los Angeles, Cal. Filed May 7, 1900.

670,905. Lamp Shade or Reflector. Reinhart W. Pittman, New York City, assignor to Alan R. Fergusson, Mount Vernon, N. Y. Filed Aug. 22, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

670,587. Continuous-Current Machine and Apparatus. Max Deri, Vienna, Austria-Hungary. Filed March 24, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

670,538. Subscriber's Telephone-Circuit. William W. Dean, Chicago, Ill., assignor to the Kellogg Switchboard & Supply Company, same place. Filed April 28, 1899.

670,564. Telephone-Receiver. Charles H. North, Cleveland, O., assignor to the North Electric Company, same place. Filed Sept. 27, 1899.

MISCELLANEOUS.

670,440. Electric Ore Concentrator. Henry M. Sutton and Walter L. Steele, Dallas, Tex. Filed July 18, 1900.

670,454. Commutator. George W. Nistle, Chicago, Ill. Filed Jan. 29, 1901.

670,463. Alarm Attachment for Drip-Pans. Louis Wahl and George Keyes, Brooklyn, N. Y., assignors of one-third to Peter Hale, same place. Filed Jan. 21, 1901.

670,474-670,475. Storage Battery. Justus B. Entz, Philadelphia, Pa., assignor to the Electric Storage Battery Company, same place. Filed July 9, 1900.

670,476. Electrical Distribution. Justus B. Entz, Philadelphia, Pa., assignor to the Electric Storage Battery Company, same place. Filed Sept. 1, 1900.

670,547. Electrical Connecting Device. John S. Schenck, Brooklyn, N. Y. Filed Jan. 20, 1900.

670,588. Primary Electric Battery. Jean P. Fontaine, Paris, France. Filed Jan. 9, 1900.

670,634. Electric Clock. Fred L. Gregory, Chicago, Ill., assignor to the Semphire Clock Company, same place. Filed March 2, 1900.

670,648. Element for Secondary Batteries. John T. Storey, Philadelphia, Pa., assignor of two-thirds to Henry B. Gross and Claude S. Jarvis, same place. Filed June 25, 1900.

670,667. Electric Heater. William S. Hadaway, Jr., New York City. Filed Sept. 24, 1898.

670,668. Apparatus for Baking. William S. Hadaway, Jr., New York City. Filed Feb. 1, 1899.

670,669. Electric Stove. William S. Hadaway, Jr., New York City. Filed Feb. 1, 1899.

670,670. Electric Stove. William S. Hadaway, Jr., East Orange, N. J. Filed June 30, 1900.

670,697. System of Telegraphy. Frederick Bedell, Ithaca, N. Y. Filed Oct. 20, 1899.

670,711. Coherer for Detecting Electric Waves. Adolf Koepsel, Charlottenburg, Germany. Filed Aug. 25, 1900.

670,774. Apparatus for Forming Elements for Electric Accumulators. William Gardiner, Chicago, Ill., assignor to the Helios-Upton Company of New Jersey. Filed April 28, 1900.

670,808. Method of Electric Welding. John C. Perry, Clinton, Mass. Filed Sept. 15, 1899.

670,877. Primary Battery and Process of Regenerating Same. Henry K. Hess, Philadelphia, Pa., assignor to Herman J. Dercum, trustee, same place. Filed Dec. 21, 1900.

670,914. Sparking Igniter for Internal-Combustion Engines. Carl H. Blomstrom, Marquette, Mich., assignor to the Lake Shore Engine Works, same place. Filed Nov. 8, 1898.

REISSUE.

11,899. Means for Propulsion of Vehicles by Electricity. Frederick J. Newman and Josef Ledwinka, Chicago, Ill., assignors, by mesne assignments, to the Hub Motor Company of New Jersey. Filed Feb. 11, 1901. Original No. 638,643, dated Dec. 5, 1899.

COMMERCIAL PARAGRAPH.

Elsewhere in this issue will be found the advertisement of Mr. William B. Lynch, 101 Beekman street, New York. Mr. Lynch has been engaged in pattern and model making for the past fifteen years and has had wide experience with electrical apparatus and the parts that go to make up electrical machinery. He is prepared to undertake pattern and model making of every description.

THE TELEPHONE WORLD.

Western Telephone Companies' Success.

President Charles S. Bash of the Home Telephone Company, Fort Wayne, Ind., tells by what means the independent movement has been developed in the West, and suggests:

"Let the Eastern telephone people pass around the subscription list for stock to the actual users of telephones—the bankers, the lawyers, the merchants, the doctors, the butchers, the bakers and candlestick makers. Our rates at Fort Wayne are about 40 per cent. less than Bell rates. We have paid a dividend on our securities every three months. We have over 2,000 subscribers on our lines (all paying). In less than five years from time of organizing, and we are adding from 25 to 40 'phones per month."

Reports from elsewhere in the West indicate that this cooperative plan has been effective wherever tried. President Eckert, of the Knickerbocker Company, says many of the independent plants in the West are 10 years ahead of anything the Bell Company has.

Representatives of the Dauphin County, Pa., Telephone Company lately placed in the hands of City Clerk Miller their agreement to the ordinance as passed by the city councils some time ago giving to the corporation permission to erect poles, string wires and operate a telephone line in Harrisburg. The company agrees to have a line in operation within the time limits prescribed by the ordinance. Work will be started, it is asserted, as soon as the weather is settled enough to permit and the preliminary arrangements can be made.

The concern known as the Telephone, Telegraph & Cable Company, which owned an interest in the National Telephone & Telegraph Company, operating exchanges in 700 towns in Northern Indiana, Southern Michigan and Northwestern Ohio, has sold its interest to H. O. Paul and C. S. Bash of Fort Wayne, Ind. The Bell Company made an effort, it is said, to get the property, but failed. The stock owned by the New York company brought \$120,000.

At a largely attended mass meeting, held at Excelsior Minn., a short time ago, a proposition was submitted by the Twin City Telephone Company to put in operation a telephone exchange and make a belt line around the lower lake. The rate made for business houses is \$2 per month; for residences \$1.50 per month; for telephones at farm houses a rate of \$15 per year.

The stockholders of the Delaware County, Pa., Telephone & Telegraph Company last week decided on a sale of the property and franchise of the company to the United Telephone & Telegraph Company, the plant to be turned over on April 1. The Delaware County Telephone & Telegraph Company was organized in opposition to the Bell Company two years ago, and has been successful. The capital stock is \$75,000, practically all paid in.

At Winthrop, Minn., the People's Telephone Company has been organized by business men, and seventy 'phones will be installed at once. The officers are: President, R. R. Stoper; vice-president, C. M. Peterson; secretary, J. A. Larson; treasurer, C. A. Benson. The capital stock is \$10,000.

The Gainesboro Telephone Company has purchased from Overall Brothers & Parker, what is known as the De Kalb County line, extending from Smithville to Alexandria, Tenn., and including the exchange at the former place. The consideration was \$2,000.

A report from Seattle, Wash., states that J. S. McGroarty, the promoter of the Independent Telephone Company, who has returned from the East, announces that all arrangements have been made for the speedy completion of the system.

The Hopkins County Telephone Company was recently organized in Cumby, Tex., with a capital stock of \$1,000. The company will string lines over the county, and also establish an exchange at Cumby.

The Juvinat Telephone Company has been cutting the Sunset Company out of a great deal of patronage in Duarte and Monrovia, Cal., and the larger concern is about to begin a vigorous war on the lesser company.

M. C. Broin and Guy Hoffman, of Ohio, have organized a company with \$200,000 capital, and completed arrangements for the construction of an underground telephone system in Tampa, Fla. Work will begin shortly.

Fresno, Cal., has commenced to put all telephone wires underground.

Indiana and Independent Telephone Companies.

Indiana claims to have more telephone companies within its borders than any other State, and to be the home of independent telephony. The latter claim is contested by several other States, and the fact is that the Bell Company never had a monopoly of the telephone business, there having been a few independent telephone companies in existence since 1878, when the first telephone exchange in the world was opened in Connecticut by Morris F. Tyler. But Indiana's first claim is apparently borne out by the report of the State Board of Tax Commissioners for the year 1900, and will have to stand until reports come from Ohio and Iowa.

This tax report shows a total of 90 telephone companies in Indiana. Of these 90 companies, 84 are independent and 6 are Bell organizations. The total assessed valuation of all of the 90 properties, exclusive of real estate, office furniture, horses and wagons, etc., which are subject to local taxation, all of said property being assessed at its true cash value, is reported to be \$2,929,190. Of this amount, \$2,128,598, or 72 per cent. of the total assessed valuation, is assessed against the properties of the 6 Bell licensees, while \$800,592 or 28 per cent., is assessed against the 84 independent telephone companies.

Of these 84 independents, one set of 8 companies, or 10 per cent. of the 84, have an assessed valuation of \$462,166, or 57 per cent. of the total assessed value of all the 84 independent properties; while another set of 8 independent companies has a total assessed valuation of only \$1,730, or \$218 each; while a third set of 8 companies has a total assessed valuation of only \$5,578, or \$735 each.

Letters patent have been granted incorporating the Florida Telegraph & Telephone Association with headquarters at Inverness. The capital stock is \$5,000, which may be increased to \$250,000. The association will construct, maintain and operate telegraph and telephone lines, offices, exchanges and instruments, connecting with other telegraph and telephone lines, and deal in real and personal property. Among the incorporators are William K. Jackson, president; James F. Wilson, vice-president, and J. M. Young, secretary and treasurer.

Articles of incorporation have been filed for a telephone company to be known as the Mandan, N. D., & Northwestern Electrical Company. The capital stock of the company is \$25,000, and the incorporators are: C. E. V. Draper, C. M. Whitmar and C. F. Miller. The company intends to build a telephone line from Mandan to Oliver County and before a great while will extend up through Mercer County and around to Hebron. This line would cover a large territory and require considerable time to complete it.

There is a marked activity in the independent telephone field throughout Texas, and it is evident that the recent decision in the Berliner case has given capitalists confidence in independent telephone enterprises. It will not be long until Texas will be well covered by independent lines, and independent exchanges will be established in all the principal towns and cities.

Within the past fortnight, rumors of startling developments in the telephone-telegraph world have been urged with uncommon persistence. Briefly, it is alleged that there is in order a programme whereby the Postal Telegraph Company will cast its interests with those of the American Telephone & Telegraph Company (the Bell), and arrange some sort of a working alliance.

The Rural Telephone Company of Waterloo, Mich., is seeking to extend its lines so as to connect up with Jackson, Howell and Ann Arbor in that State. Mason is in the circuit, so if the plans are completed the county seats of Jackson, Livingston, Washtenaw and Ingham will be included.

The National Telephone Company of Wheeling, W. Va., is now having installed in its exchange building the lightning arrester and cross-connecting board, a device patented by the Stromberg-Carlson Company and said to be the most perfect of its class.

From Springfield, O., comes the report that the National Electro-Magneto Telegraph Company has succeeded in organizing a construction company, with a capital stock of \$1,000,000. The invention is a method of telegraphing without batteries, the instrument itself generating its own electricity.

The Twin City Telephone Company has secured permission from the St. Paul, Minn., city council to establish its service at fire headquarters. The instruments will be placed in the fire alarm office, and, if satisfactory, the service will be extended to other offices in the department.

American Telephone & Telegraph Company.

The American Telephone & Telegraph Company reports for the year ended December 31:

Earnings—1900, \$9,534,499; 1899, \$7,687,381; increase, \$1,847,118. Expenses—1900, \$4,048,441; 1899, \$3,416,873; increase, \$631,568. Net revenue, 1900 \$5,486,058; 1899, \$4,270,509; increase, \$1,215,549.

Of the surplus \$937,258 was carried to reserves and \$470,199 was carried to surplus.

The balance sheet as of December 31, shows: Assets—total, \$122,234,983. Liabilities—total, \$122,234,983. Of the bills and accounts payable, \$1,322,277 is for the dividends payable January 15, 1901, to stockholders of record December 31, 1900.

The retiring directors were elected at the annual meeting of the stockholders last week.

Extensive improvements and extensions are in contemplation for the operating telephone companies, of which the Federal Telephone Company is the parent financing corporation. Bonds for \$3,000,000 of the Cuyahoga Telephone Company, the local operating company, are to be sold and the money used for the completion of the plant in Cleveland, O., and for extensions of the long-distance lines throughout the States. New exchanges and systems will be placed in Ohio towns. To secure these bonds from indiscriminate offers of former bonds of the company by individual holders the company makes a proposition that the holders sell them to an underwriting syndicate at 85, which is regarded as a fair price. It is proposed to holders who do not care to sell in accordance with the proposition that they agree not to sell for less than 102 for a year from next July, without the consent of the deposit committee, which is to represent the underwriting syndicate.

The Austell, Ga., Telephone Company was granted a charter by the Superior Court a short time ago. The incorporators are A. H. Irwin, F. W. Runyon, W. B. Westmoreland, of Cobb County, and J. H. Lauch, B. H. Veal and R. B. Claud, of Douglas County. An exchange will soon be placed in Austell and lines run from there to Atlanta, Marietta, Powder Springs, Lythia Springs and other places.

The Shenandoah County Telephone Company will erect a through telephone line from Woodstock to New Market, which will connect with through lines to Harrisonburg and Luray, Va.

A telephone line is being built from Mansfield to Pottsville via Naborton and Greening, La. It will tap the line running from Cushatta to Shreveport at Greening.

The Shellrock Telephone Company has been working the town of Rockford, Ia., and has decided to put in a telephone exchange.

The Progress Telephone & Telegraph Company of West Milton, O., has increased its capital stock from \$10,000 to \$30,000.

It is reported that a new telephone company, composed of American capitalists, will shortly be granted a charter for operating in the city of Mexico.

TELEPHONE INCORPORATIONS.

The People's Telephone Company, Jacobsburg, O. Capital stock, \$1,000.

The Citizens' Telephone Company, Middletown, O. Capital stock, \$10,000.

The Sugarcreek Township Farmers' Telephone Company, New Palestine, Ind.

The Hillsboro Telephone Company, Cleveland, O. Capital stock, \$30,000.

The Winnebago County Telephone Company, Rockford, Ill. Capital stock, \$5,000. Incorporators: Fred L. Tritle, Charles F. Tritle and H. S. Hicks.

The Wildwood Telephone Company, Markleville, Ind. Capital stock, \$500. Directors: John Biddle, Charles Biddle, Elisha Davis, Lewis Johnson and Charles Fort.

The Mountain Automatic Telephone Company, Sonora, Cal. Capital stock, \$50,000. Directors: W. O. Dowie, P. M. Keefe, M. S. Sanford, W. S. Griffith and J. P. O'Brien.

The Louisville Home Telephone Company, Louisville, Ky., to acquire by purchase or otherwise telephone and telegraph lines and plants in Louisville and to operate the same. Capital stock, \$1,000,000. Incorporators: Charles J. Doherty, John A. Armstrong, Ezekiel Rice, Ellis M. Coleman, all of Louisville, Ky., and Edward L. Barber, of Waukegan, O.

GENERAL ELECTRICAL NEWS.

Lighting.

Augusta, Ky.—Thornton F. Marshall died at his home in this city March 25. In his will he left the city \$35,000 or \$40,000 to build waterworks and an electric light plant.

Biddeford, Me.—G. F. Haley has purchased the electric light plant in this city and will make extensions.

Bloomer, Wis.—The voters of this village are to vote this month on the question of granting a franchise to an electric light company.

Boise City, Idaho.—Brennan & Davis, two capitalists of this city, have made a proposition to the people of Montpelier to put in electric light works. It is said the offer will be accepted.

Bonanza, Ore.—An electric light plant will soon be erected here. Articles of incorporation for a company with this object in view have been filed with the clerk of Klamath County and is to be known as the Summit Irrigation & Power Company. The incorporators are A. D. and R. A. Harpold and R. S. Goodrich.

Butler, Mo.—At the election this month the question of issuing \$20,000 in bonds will be voted upon for the purpose of erecting an electric light plant.

Dunkirk, O.—A bond proposition for an electric light plant is about to be submitted to the voters of this place.

Dunn, N. C.—The Legislature has passed the bill authorizing the issuance of \$35,000 of bonds for an electric light plant, etc.

Excelsior, Minn.—A. Thiss and others of Minneapolis have submitted a proposition to put in an electric lighting plant, asking that they be granted a franchise for 20 years.

Gastonia, N. C.—This city will hold an election May 6 to decide the issuance of \$25,000 of bonds for waterworks and electric light plant.

Laurel, Md.—An electric light plant is to be erected here.

Madisonville, O.—The proposition to issue bonds to the amount of \$25,000 for the improvement of the waterworks and electric light plant is to be submitted to a vote at the coming election.

Media, Pa.—The borough council has passed a resolution to build its own electric light plant.

Newton, Falls, O.—The citizens of this place intend to have electric lights.

Norman, Okla.—The citizens are talking of putting in an electric light plant.

Oquawka, Ill.—The Grand Opera House of this city is to be fitted out with an electric light plant.

Pendleton, Ind.—The town board is considering the advisability of putting in an electric light plant. W. H. Aiman of this place has asked for the franchise.

Richmond, Ind.—The effort of a number of taxpayers to prevent the construction of a municipal electric light plant recently ended in failure. An injunction suit was brought, but the court ruled against it. The city will put \$150,000 into the plant.

Richmond, Va.—W. P. Knowles, superintendent of the City Gas Works, Room 9, City Hall, will receive bids until May 1 for furnishing this city for one year with 500 electric arc lights of 1,200 candle power per light for street lighting.

Ripon, Wis.—W. H. Wheeler, of Beloit, will soon ask the Ripon council for a franchise to construct and operate an electric light plant, etc.

Sabetha, Kan.—At a recent election it was voted to issue \$10,000 in bonds for an electric light plant.

Stark, Fla.—On April 16 the citizens of this place will vote on the question of bonding for electric lights and a water plant.

Syracuse, N. Y.—This city is considering the advisability of municipal ownership of the public lighting plants.

Tipton, Ind.—The citizens have voted to erect an electric light plant next fall.

Weiser, Idaho.—At the election this month the people will vote bonds in the sum of \$60,000 for the purpose of installing an electric lighting, water and sewage system.

West Plains, Mo.—The citizens of this place are planning to erect an electric light plant. Address Councilman Hunt.

Westerly, R. I.—Westerly is to ask permission of the Legislature to establish a gas and electric plant to be owned by the town.

Wenatche, Wash.—This place is about to order an electric light plant.

Wolcott, N. Y.—Arrangements are being made to add \$7,000 worth of electrical apparatus to the electric light plant here.

Woodbury, N. J.—An electric light plant is to be erected here.

Woodbine, Ia.—At a recent council meeting it was decided to build an electric light plant.

Yorktown, Tex.—A new \$8,000 electric light plant will soon be erected here.

Street Railways.

Benton Harbor, Mich.—The Michigan & West Shore Traction Company has been granted a franchise by the city council to construct an electric railway in this city.

Boulder, Col.—The prospects for a consolidation of capital from several of the large mining companies in the Ward district for the construction of an electric narrow gauge line up Left Hand Creek are encouraging, and with the increased output of the mines there is no question but that it will ultimately be built.

Canastota, N. Y.—At a meeting of the general committee on the proposed Canastota and Morrisville trolley road the capital stock was placed at \$200,000, and \$70,000 must be raised by subscription before a company can be organized.

Cleveland, O.—Hon. M. Dodge is the promoter of a new electric railway from this city to Warren.—It is reported that the Adams Express Company is behind the Everett syndicate in the proposed consolidation of electric lines to make a continuous one between here and Detroit.

Delavan, Wis.—It is said that an electric road will be built from Beloit to Delavan Lake, which will connect with the Walworth electric road, which is to be extended to Mettowee, there to be connected with the proposed line.

Dover, N. H.—Among the electric railway charters granted by the New Hampshire Legislature are two for the formation of a complete trolley line connecting this city, Somersworth and Rochester, all situated on the eastern border of the State, with the State capital. These charters were obtained by a syndicate of Boston and New Hampshire capitalists, the head of which is Wallace D. Lovell, of Boston.

Doylestown, Pa.—The mail between Willow Grove and here is now carried by trolley.

Eldora, Mich.—The question of an electric line from Waterloo to Des Moines by way of this city and Nevada is again being considered.

Harpwell, Me.—An electric railway to this place is now being talked of.

Lawrence, Kan.—L. M. Erb has been granted a franchise to construct an electric street railway in this city.

Louisville, Ky.—The Louisville, Mt. Washington & Fairfield Electric Railway plans now have every appearance of being an early assured fact. Mr. Roland Cox, of Spencer County, is largely interested in the venture financially.

Niagara Falls, N. Y.—The Ridge Road Trolley Company has increased its capital from \$1,500,000 to \$3,000,000.

Olcott, N. Y.—The villages of Olcott and Wilson are to be united by a trolley line, probably this summer.

Rushville, Ind.—The county commissioners have granted the right of way through Arlington to the Indianapolis, Morristown & Rushville Traction Company. Work will begin on the line this spring.

Thompsonville, Conn.—A scheme has been on foot for the purchase by a syndicate not only of the Enfield & Longmeadow Electric Road, but of other roads that

would complete a continuous through line from Boston to New York. Promoters of the scheme have visited Thompsonville to look over the road and negotiations are now pending.

Toledo, O.—The Urbana, Bellefontaine & Northern Electric Railroad of Springfield was incorporated for \$50,000 to build and operate an electric road between Urbana and this city.

Van Etten, N. Y.—There is talk of building a trolley line from Horseheads to this place the coming summer.

Manufacturing.

Cincinnati, O.—The annual meeting of the Bullock Electric Manufacturing Company was held recently, and there was no change in the board or officers. The report of President George Bullock showed that there had been booked so far during the year 1901 over \$250,000 in orders.

New York City.—The Graham Brothers' Company of this city has been organized to manufacture electrical machinery on a capital of \$25,000. J. A. Graham, J. H. Graham and J. T. Booth are those interested.

Syracuse, N. Y.—The Onondaga Dynamo Company is obliged to have its men work night and day. It has been found necessary because of increased business to install a large amount of new machinery.

Company Matters.

Detroit, Mich.—Ransom E. Olds, manager of the Olds Motor Works, which was destroyed by fire several weeks ago, says that the business has so increased it will be necessary to make a large extension of the plant when they rebuild.

New York City.—Last week fire started in the upper floor of Nos. 440 and 444 Canal street, occupied by J. H. Bunnell & Co., dealers in electrical supplies. The two top floors were gutted.

Power and Transmission.

Charlotte, N. C.—Dr. Robert Wiley, of New York, is interested in the Catawba River Power Company. The company, he says, is at present discussing transmitting the power to this city.

Denver, Col.—The ordinance calling a special election May 16, to vote upon the granting of a franchise to the Pike's Power Company, was passed by the council a short time ago on second reading. The franchise gives the company the use of the streets for the transmission of light, heat and power.

Tacoma, Wash.—The plans for the development of the immense water power at Nisqually Falls, to furnish power for Tacoma manufacturing plants and those of other cities in this vicinity, are progressing well.

Automobiles.

Elizabeth, N. J.—The American Traction Company has been incorporated here with a capital stock of \$250,000. The company is to do a carrying trade, using automobiles. Herbert Knight of Newark and Daniel J. Newland and Frederick A. Raymond of New York City are all interested in the concern.

New Haven, Conn.—Col. R. S. Woodruff, of the C. S. Mersick Company, is in Chicago, endeavoring to close negotiations with the Woods Motor Cycle Company of that place, which may end in the removal of one of the firm's plants to this city.

Ogdensburg, N. Y.—Considerable interest has been aroused among the working people of this city over the possibility of a factory being established here by the Auto-Truck Company.

Providence, R. I.—The Baldwin Motor Wagon Company of this city is seeking a favorable town or city for the location of its plant.

Toledo, O.—W. L. Githens, of New York City, one of the leading men in the bicycle and automobile trust, was lately in this city, and stated that the automobile business of the trust would likely be centered here. The bicycle trust manufactures electric, steam and gasoline wagons.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: cert. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debenture; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.		
Author'd	Issued.					Author'd	Issued.						
Albany, N. Y.—Apr 1						Hartford Conn.—Apr 1							
United Traction.....	100	\$5,000,000	\$5,000,000	1 1/2 % Q.	108 1/2	109 1/4	Hartford Street Ry. Co.....	100	\$4,000,000	\$200,000	8 % S., Oct.	150	—
(Consolidation of the Albany and Troy City Railway.)							Hartford & West Hartford RR.....	100	1,000,000	247,000	—	—	—
Allentown Pa.—Apr 1						Holyoke Mass.—Apr 1							
Allentown & Lehigh Val. Trac Co		4,000,000	1,800,000	—	—	15	Holyoke Street Ry. Co.....	100	400,000	400,000	8 % A., June	207 1/2	212
Bridgeport, Conn.—Apr 1:							Hoboken N. J.—Apr 1						
Bridgeport Traction Co.....	100	2,000,000	2,000,000	1 % Aug.	100	—	North Hudson Co. (N. J.) Ry. Co..	25	1,250,000	1,000,000	8 %	180	—
Baltimore Md.—Apr 1							Indianapolis, Ind.—Apr 1						
a United Rail ways & Elec. Co. com.	50	24,000,000	18,000,000	—	16 1/2	17	Indianapolis Street Ry.....	—	5,000,000	5,000,000	—	25	25 1/2
Boston, Mass.—Apr 1							Lancaster, Pa.—Apr 1						
New England Street Ry.....	25	5,000,000	1,081,925	1 % Q., Jan. 15.	—	—	Pennsylvania Traction Co.....	100	10,000,000	9,900,000	—	—	—
North Shore Traction Co.....	100	4,000,000	4,000,000	—	15	16	Lancaster & Col. Electric Ry.....	—	—	87,500	—	—	—
North Shore Traction Co.....	100	2,000,000	2,000,000	6 % S., A. & O.	95	87	West End Street Railway.....	—	—	—	—	—	—
West End Street Ry. Co.....	50	10,000,000	—	8 % S., Oct., '99.	112	118	Louisville, Ky.—Apr 1:						
West End Street Ry. Co.....	50	4,400,000	6,400,000	4 % S., Jan.	112	118	Louisville Ry.....	100	4,000,000	3,500,000	1 1/2 % Q., April.	82	88
Boston Elevated R. R.....	100	10,000,000	—	3 1/2 % Aug. 90.	176 1/2	177	Louisville Ry.....	100	2,500,000	2,500,000	2 1/2 % S., Oct. 1.	112	118
Brooklyn N. Y.—Apr 1:						Minneapolis, Minn.—Apr 1							
Brooklyn City Ry.....	100	2,000,000	1,928,400	—	285	240	Twin City Rapid Transit.....	100	17,000,000	15,010,000	—	68 1/2	68 1/2
Brooklyn Rap. Transit Co., tr cert.	100	48,000,000	48,000,000	—	88 1/2	88 1/2	Twin City Rapid Transit.....	—	8,000,000	1,712,200	1 1/2 % Q., Oct.	186	187
Brooklyn Heights Railroad.....	100	200,000	200,000	—	107	109	Montreal, Canada.—Apr 1						
Brooklyn City RR.....	100	12,000,000	12,000,000	8 % Q., Jan.	287	289	Montreal Street Ry. Co.....	50	4,000,000	4,000,000	8 % S., M. & N.	263 1/2	265
Brooklyn Queens Co. & Sub. RR.	100	2,000,000	2,000,000	—	—	—	Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1 1/2 % S., J. & J.	108 1/2	109 1/2
Coney Island & Brooklyn RR.	100	2,000,000	1,884,200	2 1/2 % Nov., '99.	825	882	Memphis Tenn.—Apr 1						
Kings County Elevated.....	100	4,750,000	4,750,000	—	—	—	Memphis Street Railway Co.....	100	800,000	800,000	—	25	—
Kings County Traction Co.....	100	4,500,000	4,500,000	1 % July	—	—	New Haven, Conn.—Apr 1:						
Nassau Electric Railroad.....	100	6,000,000	6,000,000	—	75	80	Fair Haven & Westville RR.....	25	2,000,000	2,000,000	8 % S., Sept.	89	41
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000	—	—	—	New Haven Street Railway Co.....	100	1,250,000	1,000,000	2 1/2 % A., July	—	—
Brooklyn, B. & W. E. Railroad..	—	1,000,000	1,000,000	—	—	—	New Haven & Centerville.....	100	700,000	800,000	—	—	—
Buffalo N. Y.—Apr 1:						New Orleans, La.—Apr 1							
Buffalo & Niagara Falls Elec. Ry...	100	1,250,000	1,250,000	—	74	75	Canal & Claiborne RR. Co.....	40	240,000	240,000	4 % S., July	—	—
Buffalo Railway Co.....	100	6,000,000	5,870,500	1 % Q. Dec., '99.	99	100	New Orleans & Carrollton RR.....	100	1,200,000	1,200,000	1 1/2 % Q., Oct.	148 1/2	156
Columbus O.—Apr 1						New Orleans Traction Co new pfd.							
Columbus Street Railroad.....	100	8,000,000	8,000,000	1 % Q., Feb.	36	39	New Orleans Traction Co new pfd.	100	2,000,000	2,000,000	8 % S., Jan.	16	26
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000	—	92	98	Crescent City RR.....	100	2,000,000	2,000,000	8 % S., Jan.	20 1/2	26
Charleston, S. C.—Apr 1						New York.—Apr 1:							
Charleston City Ry. Co.....	50	100,000	100,000	8 % S.	—	—	Central Croastown RR.....	100	600,000	600,000	2 1/2 % Q.	255	300
Enterprise City RR. Co.....	25	1,000,000	250,000	—	—	—	Christopher & 10th St. RR. guar.	100	650,000	650,000	2 % Q., Oct.	175	185
Chicago, Ill.—Apr 1						Dry Dock, E. B. Rdwy & Battery RR.							
Chicago City Ry. Co.....	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99.	255	263	Dry Dock, E. B. Rdwy & Battery RR.	100	1,200,000	1,200,000	1 1/2 % Q., Nov.	120	125
Chicago & South Side R. T. RR.....	100	10,828,800	10,828,800	—	94 1/2	10	Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000	2 1/2 % Q., Feb., 1900.	165 1/2	169
Lake Street Elevated RR.....	100	10,000,000	10,000,000	—	88 1/2	80 1/2	Bleeker St. & Fulton St. Ry. guar.	100	900,000	900,000	4 % A., July.	85	87
Metropolitan West Side Elev. Ry...	100	15,000,000	7,000,000	Feb 28 1900.	209	210	Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000	2 1/2 % Q.	282	240
Met. West Side El., pfd.....	100	15,000,000	9,000,000	—	197	240	Gen. Park N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2 1/2 % Q.	194	200
North Chicago Street RR.....	100	10,000,000	6,600,000	8 % Q., Jan.	99 1/2	103	Eight Avenue RR.....	100	1,000,000	1,000,000	—	390	405
North Chicago City RR.....	100	500,000	249,900	—	102 1/2	108	42d St. & Grand St. Ferry RR. guar.	100	700,000	748,000	4 % Q.	392	402
South Chicago City Railway.....	100	2,000,000	1,608,200	—	15 1/2	15 1/2	Ninth Avenue RR.....	100	800,000	800,000	—	198	201
West Chicago St. RR. Co.....	100	30,000,000	18,189,000	1 1/2 % Q., Feb.	56	57	Sixth Avenue RR.....	100	2,000,000	2,000,000	—	385	225
Union Traction Ry.....	100	1,250,000	624,900	8 % S.	—	—	Twenty-third St. R. R. Co. guar.	100	600,000	600,000	4 % Q.	400	410
Union Traction Co.....	100	2,000,000	2,000,000	5 % S.	—	—	Second Avenue RR.....	100	2,800,000	1,862,000	2 % Q., Jan.	198	201
Cincinnati, Ohio.—Apr 1:						Third Avenue RR.....							
Cincinnati Inc. Plane Ry.....	50	1,000,000	875,000	—	—	—	42d St. & Grand St. Ferry RR. guar.	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.	121	121 1/2
Cincinnati Inc. Plane Ry.....	50	150,000	150,000	—	—	—	42d St. & Grand St. Ferry RR. guar.	100	2,800,000	2,800,000	—	65	75
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2 1/2 % Feb.	124 1/2	125	Union (Hueck) Ferry St.....	100	2,000,000	2,000,000	—	190	200
Cincinnati Street Ry. Co.....	100	18,000,000	14,000,000	1 1/2 % Q., Jan.	124 1/2	127	Newark N. J.—Apr 1						
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1 1/2 % Q., Jan.	124 1/2	127	Consolidated Traction Co. of N. J..	100	15,000,000	15,000,000	—	62	68
Cleveland, Ohio.—Apr 1						Pittsburg, Pa.—Apr 1							
Akron, Bed. & Elev. Elec. Ry.....	100	1,000,000	1,000,000	3/4 % Jan.	48	50	Allegheny Traction Co.....	50	500,000	500,000	—	27	28
Cleveland City Ry.....	100	8,000,000	7,000,000	8 1/2 % Jan.	102	102 1/2	Consolidated Traction Co.....	50	15,000,000	15,000,000	2 % Jan.	28 1/2	24
Cleveland Electric Ry.....	100	12,000,000	12,000,000	3/4 % Q., Oct., '99.	88	84 1/2	Consolidated Traction Co.....	50	9,478,800	9,478,800	8 % Nov.	64 1/2	60 1/2
Detroit, Mich.—Apr 1						Central Traction Co.....							
Detroit Citizens' Street Ry.....	100	2,000,000	1,250,000	—	100 1/2	—	Central Traction Co.....	50	1,800,000	1,800,000	1 1/2 % Nov.	72 1/2	78
Fl. Wayne & Belle Isle Ry.....	100	—	1,200,000	—	175	—	Citizens' Traction Co.....	50	8,000,000	8,000,000	6 % A.	72 1/2	72 1/2
Rapid Railway Co.....	100	250,000	250,000	—	90	100	Duquesne Traction Co.....	50	8,000,000	8,000,000	6 % A.	—	—
Detroit Electric Railway.....	100	1,000,000	1,000,000	—	100	110	Pittsburg Traction Co.....	50	2,500,000	2,500,000	8 % Nov.	—	—
Wyandotte & Detroit River Ry...	100	250,000	250,000	—	—	—	Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2 % July	27	29
Dayton O.—Apr 1:						Pittsburg & Birmingham Trac. Ry.							
City Railway Co.....	100	1,500,000	1,470,800	1 1/2 % Q.	140	145	Pgh., Allegheny & Man. Trac. Co..	50	8,000,000	8,000,000	2 % Aug.	—	—
City Railway Co.....	100	600,000	600,000	1 1/2 % Q.	170	—	Pittsburg & Birmingham Trac. Ry.	25	1,800,000	1,800,000	1 % Oct.	41	48 1/2
People's Street Railway.....	100	1,100,000	1,100,000	—	114	115	Pittsburg & West End Ry.....	50	8,000,000	8,000,000	5 % A., June	—	—
Unlisted.						Unlisted.							
The United Railway & Electric Company						Consolidated Traction Company							
Consolidated Railway Company						Consolidated Traction Company							
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TELEPHONE AND TELEGRAPH COS.

* Unlisted. † Paid in. ‡ Full paid. § Outstanding. ¶ Ex-div.
a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6% on stock per annum.
b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
c Practically all shares owned by Union Traction Company.
d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
e Leased to Electric Traction Company.
f Controlled by Frankford & Southwark Passenger Railway.
g Leased to People's Passenger Railway at \$5 per share.
h Majority of stock owned by People's Traction Company.
i Leased to "Union Traction Company."
j Lease transferred to Union Traction Company.
k Leased to Union Traction Company at a rental of \$10,000 per annum in 1896-7-8, & \$20,000 in 1899-1900 and \$30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.
l Dividend of 10% guaranteed by Reading Traction Company.
m Dividend of 6% guaranteed by Reading Traction Company.
n Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

Unlisted.

BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

NAME.		Amount.		Due	Interest periods.	Bid.	Asked.	NAME.		Amount.		Due	Interest periods.	Bid.	Asked.
Authorized.	Issued.	Authorized.	Issued.												
Albany N. Y.															
Date of Quotation—Apr 1, 1901															
The Albany Ry. Co. Cons. mtg. 5s.	\$500,000	427,500	1930	J. & J.	118	119									
The Albany Ry. Co. Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	116%										
Watervliet Turnpike & RR. 1st mtg. 5s.	850,000	850,000	1919	M. & N.	125										
Watervliet Turnpike & RR. 2d mtg. 5s.	150,000	150,000	1919	M. & N.	124 1/4	127									
Troy City Railway Co. 1st 5s.	.....	.....	1942	.....	116										
Interest guar. by Albany Ry. Co. Principal and interest guar. by Albany Ry. Co.															
Baltimore Md.															
Date of Quotation—Apr 1, 1901															
United Electric Ry. Co. 1st mtg. g. 4s	88,000,000	18,000,000	1949	M. & S.	102	102 1/2									
..... income 4s.	14,000,000	.....	1949	J. & D.	74 1/2	75									
Baltimore City Pass. Ry. 1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118 1/2										
Baltimore Traction Co. 1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120									
Baltimore Trac. Co. Exten. & Imp. g. 5s.	1,250,000	1,250,000	1901	M. & S.	104 1/2										
Bal. Trac. Co. No. Balto. div. 1st mtg. g. 5s.	1,750,000	1,750,000	1942	J. & D.	121	121 1/2									
Bal. Trac. Co. Coll. Trust 1st mtg. g. 5s.	750,000	.....	1900	J. & J.	101										
Baltimore Traction Co. Convertible 5s.	800,000	.....	1908	N. & M.	108 1/2										
Central Pass. Ry. Co. 1st mtg. 5s.	96,000	117,000	1912	J. & J.	.....										
Central Pass. Ry. Co. Cons. mtg. 5s.	604,000	580,000	1902	M. & N.	119	121									
City & Suburban Ry. Co. 1st mtg. g. 5s.	8,000,000	8,000,000	1922	J. & D.	116	117									
Lake Roland Elev. 1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117										
*All of the bonds of the above companies, marked +, have been assumed by the United Railways & Electric Company.															
Boston Mass.															
Date of Quotation—Apr 1, 1901															
Lynn & Boston RR. 1st mtg. g. 5s	5,579,000	3,702,000	1924	J. & D.	114	115									
West End Street Ry. Deben. g. 5s	8,000,000	3,000,000	1902	M. & N.	104 1/2	106									
West End Street Ry. Deben. g. 4 1/2s.	2,000,000	2,000,000	1914	M. & S.	112										
*\$1,674,000 in escrow to retire outstanding bonds of absorbed companies.															
Charleston S. C.															
Date of Quotation—Apr 1, 1901.															
Enterprise Street RR. 1st mtg. 5s.	500,000	47,000	1906	J. & J.	.....	.....									
Charleston City Ry. 1st mtg. 5s.	850,000	.....	.....	J. & J.	106	.....									
*Controlled by Charleston St. Ry. Co.															
Chicago Ill.															
Date of Quotation—Apr 1, 1901															
Chicago City Ry. 1st mtg. 4 1/2s.	6,000,000	4,619,500	1901	J. & J.	101 1/2	2 1/2									
Chicago Passenger Ry. 1st mtg. 5s.	400,000	400,000	1908	F. & A.	102	102									
Chicago Passenger Ry. Cons. mtg. 5s.	1,000,000	600,000	1929	J. & D.	.....	.....									
Chicago & So. Side R. T. 1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	.....	.....									
Chicago & So. Side R. T. 2d mtg. 5s.	1,500,000	780,000	1907	J. & J.	.....	.....									
Chicago West Div. Ry. 1st mtg. 4 1/2s.	4,040,000	4,040,000	1902	J. & J.	108 1/2	109									
Lake Street Elevated RR. 1st mtg. g. 5s.	7,574,000	8,781,200	1928	J. & J.	.....	.....									
Metrop. W. Side Elev. Ry. 1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96 1/2									
North Chicago St. RR. 1st mtg. 5s.	8,171,000	8,171,000	1906	J. & J.	106	.....									
North Chicago St. RR. Cert. indebt. 5s.	500,000	500,000	1911	J. & J.	.....	.....									
North Chicago City Ry. 1st mtg. 5s.	500,000	500,000	1900	J. & J.	.....	.....									
North Chicago City Ry. Consol. 4 1/2s.	2,500,000	2,500,000	1927	M. & N.	108	.....									
West Chicago St. RR. 1st mtg. 5s.	4,100,000	8,969,000	1928	M. & N.	111	111 1/2									
West Chicago St. RR. Deben. 6s.	2,700,000	700,000	1911	J. & D.	101	102									
West Chicago St. RR. Cons. mtg. g. 5s.	12,500,000	6,000,000	1908	.....	106 1/2	107									
W. Chicago St. RR. Tunnel 1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	.....	.....									
*Redeemable at option on 60 da. notice.															
Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.															
Subject to call after Oct. 1, 1899, at \$10 and interest.															
Assumed by W. Chl. RR. Co., lessee.															
Int. guar. by W. Chicago St. RR. Co.															
Cincinnati, O.															
Date of Quotation—Apr 1, 1901.															
Cin. New & Cov. St. Ry. 1st Cons. mtg. g. 5s	8,000,000	2,500,000	1922	J. & J.	114 1/2	115									
Mt. Adams & Eden Pk In. 1st mtg. 5s.	46,000	46,000	1900	A. & O.	108 1/2	104									
Mt. Adams & Eden Pk In. 1st mtg. 5s.	100,000	100,000	1905	A. & O.	114	.....									
Mt. Adams & Eden Pk Inc. Cons. mtg. 5s	581,090	581,000	1906	M. & S.	108 1/2	.....									
St. Cov. & Cin. St. Ry. 1st mtg. 5s.	250,000	250,000	1912	M. & S.	121 1/2	122 1/2									
St. Cov. & Cin. St. Ry. 2d mtg. 5s.	400,000	400,000	1902	J. & J.	122 1/2	187									
*Assumed by the Cin. St. Ry. Co.															
*\$250,000 reserved to retire 1st mtg. bds.															
Cleveland O.															
Date of Quotation—Apr 1, 1901															
Brooklyn Street RR. Co. 1st mtg. 5s.	600,000	600,000	1908	M. & S.	106 1/2	107									
Cin. New & Cov. St. Ry. Cons. mtg. 5s.	8,000,000	2,500,000	1922	J. & J.	118 1/2	114 1/2									
Cleveland City Cable Ry. 1st mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	105 1/2	106									
Cleveland Electric Ry. Co. 1st mtg. g. 5s.	8,500,000	1,249,000	1918	M. & S.	106	107									
Columbus (O.) Cent. Ry. 1st mtg. g. 5s.	1,500,000	1,500,000	1910	M. & N.	.....	.....									
East Cleveland RR. 1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	107 1/2	.....									
Fl. Wayne (Ind.) Elec. Ry. 1st mtg. g. 5s.	600,000	.....	1922	M. & N.	.....	.....									
Lorain (O.) Street Ry. 1st mtg. 5s.	200,000	200,000	1915	J. & J.	.....	.....									
St. Ry. Co. Grand Rapids. 1st mtg. 5s.	600,000	600,000	1912	J. & D.	.....	.....									
*\$1,900,000 in escrow to retire bonds of absorbed companies, marked a.															
Interest guar. by Cons. St. Ry. Co.															
Detroit, Mich.															
Date of Quotation—Apr 1, 1901															
Detroit Citizens' St. Ry. 1st mtg. 5s.	7,000,000	8,885,000	1905	A. & O.	.....	102 1/2									
Fl. Wayne & Belle Isle Ry. 1st mtg. 5s.	400,000	877,000	1902	A. & O.	.....	.....									
The Detroit Ry. 1st mtg. 5s.	1,800,000	1,800,000	1926	J. & D.	105	106 1/2									
*\$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.															
New Haven Conn.															
Date of Quotation—Apr 1, 1901.															
New Haven St. Ry. 1st mtg. g. 5s.	600,000	600,000	1918	J. & D.	111	.....									
New Haven (Edgewood Div.) 1st mtg. 5s.	260,000	260,000	1914	J. & D.	111	.....									
Windsor Avenue RR. 1st mtg. g. 5s.	100,000	800,000	1912	M. & N.	109	.....									
Windsor Avenue RR. Deben. g. 5	100,000	24,000	1912	M. & S.	.....	.....									
New Orleans La.															
Date of Quotation—Apr 1, 1901.															
Canal & Claiborne RR. Cons. mtg. 5s.	\$150,000	\$150,000	1912	M. & N.	105	.....									
Crescent City RR. 1st mtg. 5s.	.....	80,000	1899	M. & N.	105 1/2	.....									
Crescent City RR. Cons. mtg. g. 5s.	5,000,000	8,000,000	1947	J. & J.	.....	.....									
New Orleans City RR. 1st mtg. 5s.	416,500	899,000	1908	J. & D.	108	112									
N. Orleans City & Lake RR. 1st mtg. g. 5s.	5,000,000	2,599,500	1947	J. & J.	112	118									
Orleans & Carrollton RR. 2d mtg. g. 5s.	850,000	850,000	1907	F. & A.	.....	.....									
Orleans Railroad Co. Cons. mtg. 5s.	800,000	800,000	1912	J. & J.	.....	.....									
St. Charles St. RR. Co. 1st mtg. 5s.	800,000	75,000	1907	J. & D.	.....	.....									
*\$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.															
*\$390,000 outstanding.															
New York.															
Date of Quotation—Apr 1, 1901.															
Atlantic Ave. (Brooklyn) Imp. g. 5s	1,500,000	1,500,000	1984	J. & J.	95	.....									
Atlantic Av. (Brooklyn) 1st gen. mtg. 5s	759,000	759,000	1909	M. & S.	107 1/2	110									
Atlantic Av. (Brooklyn) Cons. mtg. 5s	8,000,000	1,966,000	1981	A. & O.	115	116									
Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1948	J. & D.	128	125									
Bro'dway & 7th Ave. 1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105 1/2									
Bro'dway & 7th Ave. 2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110 1/2									
Bro'dway Surface 1st mtg. 5s.	1,125,000	1,125,000	1924	.....	115	117									
Bro'dway Surface 2d mtg. 5s.	1,000,000	1,000,000	1905	.....	105	106									
Brooklyn City RR. Co. 1st cons. mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117									
Brooklyn City & Newtown 1st mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	115	116									
Brooklyn Bath & W. E. RR. Gen. mtg. 5s.	1,000,000	448,000	1908	J. & J.	101	.....									
Brooklyn Heights RR. 1st mtg. 5s.	250,000	250,000	1941	A. & O.	104	.....									
Brooklyn Q's Co. & Sub'n. 1st mtg. 5s.	8,500,000	8,500,000	1941	J. & J.	112	.....									
Brooklyn Q's Co. & Sub'n. 1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	.....									
Brooklyn Rapid Transit. 1945 gold 5s.	7,000,000	5,													

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bid.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—Apr 1 1901						
Jefferson Avenue Ry.....1st mtg. 5s.	270,000	270,000	1905	M. & N.	162	1.8
Lindell Ry. Co.....1st mtg. 5s.	1,500,000	1,500,000	1911	F. & A.	167	168
Missouri RR. Co.....1st mtg. 5s.	1,000,000	700,000	1916	M. & N.	106	106
Mount City RR. Co.....1st mtg. 5s.	400,000	800,000	1910	A. & O.	104½	105½
People's RR. Co.....1st mtg. 5s.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 7s.	75,000	75,000	1903	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 5s.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric 1st mtg. 5s.	75,000	75,000	1906	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
St. Louis & Sub. Ry.....1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5s.	800,000	800,000	.....	.....	80	84
Southern Electric Ry.....Cons. mtg. 5s.	500,000	500,000	1909	M. & N.	106	108
Taylor Avenue St. Ry.....1st mtg. g. 5s.	500,000	500,000	1918	J. & J.	116½	117½
Union Depot RR. Co.....1st cons. mtg. 5s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.....Cons. mtg. 5s.	2,500,000	1,787,000	1918	J. & J.	121	122
†Controlled by St. Louis RR. Co.						
†Controlled by Union Depot RR. Co.						
†Controlled by Lindell RR. Co.						
†\$200,000 in escrow to retire 1st & 2d mtg.						
†\$600,000 in escrow.						
†\$200,000 in escrow to retire 1st mtg. 5s.						
San Francisco Cal.						
Date of Quotation—Apr 1 1901.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
Ferries & Cliff House Ry.....1st mtg. 5s.	650,000	650,000	1914	M. & N.	.....	117
Geary St., Park & Ocean RR.....1st mtg. 5s.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. g. 5s.	8,000,000	8,000,000	1918	J. & J.	126½	.....
Metropolitan Ry. Co.....1st mtg. 5s.	200,000	.....	.....	.....	.....	.....
Omnibus Cable Co.....1st mtg. 5s.	2,000,000	2,000,000	1918	A. & O.	126½	.....
Park & Cliff House RR.....1st mtg. 5s.	850,000	850,000	1912	J. & J.	105½	107
Park & Ocean RR.....1st mtg. 5s.	250,000	250,000	1914	J. & J.	115	.....
Powell St. Ry.....1st mtg. 5s.	700,000	700,000	1912	M. & N.	.....	125
Utter St. Ry. Co.....1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	.....	.....
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Apr 1 1901						
Felt Ry. Co.....Cons. mtg. 5s.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 5s.	500,000	500,000	1914	A. & O.	182	.....
Eckington & Soldiers' Home Ry.....1st mtg. 5s.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 5s.	500,000	500,000	1901	J. & J.	.....	.....
†\$50,000 in escrow to retire 1st mtg. 5s.						
Miscellaneous						
Date of Quotation—Apr 1 1901						
Bridgeport Traction Co.....1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 5s.	5,000,000	8,548,000	1981	F. & A.	118	.....
City of Buffalo Ry. Co.....1st cons. m. 5s.	4,000,000	8,000,000	1988	M. & N.	104	105
Crosstown St. Ry. (Buffalo) 1st mtg. 5s.	8,000,000	2,866,000	1982	M. & N.	112	118
Columbus (O.) St. Ry.....1st cons. g. 5s.	3,000,000	2,261,000	1982	J. & J.	115	.....
Consolidated Traction (N. J.) 1st mtg. 5s.	15,000,000	18,965,000	1988	J. & D.	111½	111½
Crosstown St. Ry. (Colo.) 1st mtg. g. 5s.	2,000,000	572,000	1988	J. & D.	115	115½
Denver City Cable Ry.....1st mtg. g. 5s.	4,000,000	8,800,000	1920	J. & J.	20	.....
Denver Con. Tram'y Co.....Con. m. g. 5s.	4,000,000	922,000	1988	A. & O.	80	85
Louisville (Ky.) Ry.....1st cons. mtg. g. 5s.	6,000,000	4,981,000	1980	J. & J.	119	119½
Minneapolis St. Ry. 1st cons. mtg. g. 5s.	5,000,000	4,060,000	1919	J. & J.	110½	110½
No. Hudson Co. Ry. (N. J.) Cons. mtg. 5s.	8,000,000	2,878,000	1928	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.) 2d mtg. 5s.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.) Deb. 5s.	500,000	489,000	1902	F. & A.	.....	.....
Paterson (N. J.) Ry.....Cons. mtg. g. 5s.	1,250,000	1,000,000	1981	J. & D.	.....	.....
Rochester (N. Y.) Ry.....1st mtg. 5s.	8,000,000	2,000,000	1980	A. & O.	.....	.....
St. Paul City Ry.....Cons. g. 5s.	5,500,000	4,298,000	1987	.....	105½	106
St. Paul City Ry.....Deb. g. 5s.	1,000,000	1,000,000	1900	.....	108	.....
†\$1,000,000 in escrow to retire 1st and 2d mtg. 5s.						
†\$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
†\$760,000 in escrow to retire bonds of U. St. RR. Co.						
†\$87,000 in treasury.						
†\$960,000 reserved to redeem prior liens						
†\$620,000 in escrow.						

*With int'res

ELECTRIC LIGHT AND ELECTRIC MFG. COs

Boston, Mass.						
Date of Quotation—Apr 1 1901						
Delaware Gas Lt. Co.....1st m. 5s. g.	800,000	800,000	.....	J. & J.	106	108
Edison Elec. Illuminating Co., Boston	2,026,000	.....	.....	Quar.	157	.....
General Electric Co., gold coup. deb. 5s.	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa						
Date of Quotation—Apr 1, 1901						
Allegheny County Light Co.....5s.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Scrip 5s.	195,570	.....	.....	M. & N.	.....	.....
Miscellaneous.—(Apr 1 1901.)						
Edison El. Ilig. Co. (N. York) 1st m. 5s.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilig. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1998	.....	124	.....
Edison Elec. Ilig. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122½	124
Edison Electric Light (Philadelphia)...	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	.....	1987	A. & O.	100	101
Kings Co. El. Lt. & Po. Co. pur. money 6s.	5,178,000	.....	1997	A. & O.	120	122
Milwaukee El. Ry. & Lt. Co. 1st cons. g. 5s.	8,000,000	.....	.....	F. & A.	102½	.....
United Elec. Light & Power Co (N. Y.)...	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—Apr 1, 1901.						
American Bell Telephone.....4s.	.....	.....	1908	F. & A.	100½	101
Northwestern Telephone Co.....7s.	.....	.....	.....	.....	.....	.....
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 5s.	.....	.....	.....	.....	114	115
Chesapeake & Potomac Teleph. Co.....5s.	.....	.....	1911	J. & D.	108	106

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—Apr 1 1901						
American Electric Heating.....7s.	500,000	500,000	.....	.....	.....	.....
Armstrong & Sims Engine Co.....4s.	.....	.....	1908	J. & J.	106	107
Barnes & Smith Car Co.....4s.	.....	.....	.....	.....	.....	.....
Carborandum Mfg Co.....4s.	75,000	.....	.....	.....	115	127
Worthington Pump Co.....(Foreign).	.....	.....	.....	.....	.....	.....

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16¾c.; Lake, 16½@17c.; casting, 16½@16¾c.

The New York Stock Exchange will be closed on Friday and Saturday.

The New Orleans Lighting Company, capital \$2,000,000, was incorporated at Trenton, N. J., on Saturday.

Dividend disbursements of industrial corporations for April 1 are computed at \$21,629,600 as compared with \$26,166,430 for March.

Henry D. Moore, of Philadelphia, has purchased the large electric light plant at Ocean City, N. J., from the Ocean City Association.

Philadelphia Union Traction earnings for the first eighteen days of March, it is said, were about \$23,000 ahead of the corresponding period last year.

The New York and New Jersey Telephone Company has declared the regular quarterly dividend of 1½ per cent, payable April 15 to stock of record April 5.

It is estimated by a financial authority that \$24,000,000 will be paid out in dividends this month, making total for four months of the current year about \$50,000,000.

A syndicate of Cleveland banks and trust companies has been formed to underwrite the securities of the Aurora, Wheaton & Chicago Electric road to the sum of \$3,000,000.

The regular quarterly dividend of 3 per cent. on North Chicago Street Railway, guaranteed by the Union Traction Company, is payable April 15. Books close on April 6.

The New England Telephone and Telegraph Company has declared a regular quarterly dividend of \$1.50, payable May 15 to stockholders of record April 25. Transfer Books close April 26 and open May 15.

A Chicago dispatch states that the management of the Illinois Electric Vehicle Transportation Company has received more than enough proxies from stockholders to carry through the plan to liquidate the concern.

Rumor has it that President Vreeland, of the Metropolitan, has in the last week been in frequent conference with Brooklyn Rapid Transit officials, and that Pennsylvania interests are also figuring in some way in these conferences.

The following are quotations for some of the industrial stocks not quoted elsewhere: Electrical Lead Reduction, 5@5½; Electric Boat, 24@26; Electric Vehicle, 14@16; Tel. & Tel. Company of America (full paid) 6@7; Electric Company of America, 8¼@8½.

At the annual meeting of the stockholders of the New York Electric Vehicle Transportation Company Monday the retiring board of directors was re-elected, with the exception of Robert McLloyd. His place was filled by G. Herbert Condict. The board of directors will meet in a few days and re-elect the present officers.

A special meeting of the stockholders of the New England Electric Vehicle Transportation Company has been called to be held in Jersey City, April 20 to act upon the recommendation of the directors that the company be dissolved. In a circular to stockholders, the directors state that the company has been running at a loss since it began business.

The United Electric Company of New Jersey on Saturday last gave a collateral mortgage to the New Jersey Title Guarantee Company, of Newark, for \$20,000,000. The mortgage bears 4 per cent. interest in gold and matures in fifty years. It is given to secure a new issue of bonds. The company gave a like mortgage last year. The mortgage was made to cover the cost of absorbing numerous electric plants throughout New Jersey.

The Bell Telephone Company of Toronto, Ont., has a bill before the Dominion Parliament asking for power to increase its capital stock to an amount not exceeding \$10,000,000, including the present authorized stock. This will make the third increase in capital stock since the company's inception. Incorporated in 1884 with a capital of half a million dollars, an advance to \$1,500,000, in addition to the original amount, was permitted in 1884. Eight years later, an increase to an amount not exceeding \$5,000,000, was sanctioned, and now a capital stock of ten millions is aimed at.

The transfer books of the Westinghouse Electric & Manufacturing Company will close April 9 and reopen April 20, to allow the stockholders to subscribe for one share of additional stock at \$55 in proportion to each five shares of existing stock. The present additional issue is \$3,000,000 of the \$10,000,000 authorized February 20. A syndicate has underwritten the entire amount. Subscriptions must be made by April 20, at the office of August Belmont & Co., and accompanied by payment of \$25 a share. The balance of \$30 a share is payable June 15, at which date the stock will be delivered. Transferable receipts will be given upon receipt of the first payment. The new stock will participate in all dividends after May 15.

Wilson & Stephens offer at 102½ and accrued interest \$1,000,000 New York and Queens Electric Light and Power Company (operating in the City of New York, Borough of Queens), 5 per cent. first consolidated mortgage gold bonds, due August 1, 1914, interest payable February and August; the Union Trust Company of New York, trustee. The total issue authorized is \$2,500,000 of which \$200,000 remains reserved in the treasury for future extensions; in hands of trustees to retire like amount of New York and Queens Electric Light and Power Company 5 per cent. bonds, \$391,000; outstanding in hands of public (being bonds exchanged to date for underlying bonds), \$560,000, leaving an issue of \$1,349,000 of which \$1,000,000 is now offered, the balance of \$349,000 having been privately disposed of. Details as to the capitalization and earnings of the company are attached to the banker's announcement.

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EDITORIAL NOTES.

A Frenchman's Opinion of Edison and Tesla.

It is often-times amus-
ing to hear persons dis-
cuss on subjects of
which they know little
or nothing. A recent
cable dispatch from Paris to the N. Y. "World"
states that the representative of that paper
interviewed Eugene Schneider, head of the
Creusot Iron Works, the most important rail,
locomotive and gun factory in France, about
Thomas A. Edison's new claim that he has dis-
covered a process which will blast America's
steel supremacy. This process has created
considerable curiosity there and in England,
because if Mr. Edison could really separate
hematite from magnetite, converting the
former into Bessemer steel, enormous Euro-
pean ore deposits now unprofitable would yield
richly.

Mr. Schneider and his chief mining engineer
expressed themselves skeptically regarding the
new discovery. Mr. Schneider said:

"What is the use of discussing Edison's ad-
vertising dreams? He has no special knowl-
edge of metallurgy, and the problems he claims
to have solved have engrossed scientists all over
the world.

"Let Edison occasionally do what he claims
he can do and then we will be willing to give
him attention. But Edison's tactics, like
Tesla's, consist of finding what difficulty puzzles
scientists and announcing that their own
genius is about to solve it. But when the time
comes neither realizes his glowing promises.

"Let it be said once and for all that real
scientists all over the world consider Edison
and Tesla a pair of humbugs.

"What has Edison discovered except the
phonograph, which was a chance discovery and
not the result of scientific perspicacity. Not
electrical incandescence, for that was really
invented in Germany; nor the biograph, which
was discovered here by Lumiere, nor anything
of real importance.

"On the other hand has Tesla destroyed the
Spanish fleet, as promised, or telephoned across
the ocean, or lighted houses without wires, or
entered into communication with the planet
Mars?

"It is a perfect wonder that the American
public, with its quick sense of humor, has not
long ago shamed these two cheeky pretenders
into silence."

Assuming that the above is a correct report
of the interview, we think the head of the
Creusot Iron Works has committed a grievous
error in referring in the way he did to two
such men as Edison and Tesla.

That Edison is not a scientist every one will
agree, but on the other hand he has given to
the world invention after invention of untold
value, the Frenchman's statement to the con-
trary notwithstanding. He did more toward
perfecting incandescent electric lighting than
any other investigator, invented the phono-
graph and gave to the world the quadruplex
system of telegraphy, to say nothing of the
three-wire system, the low-resistance dynamo
and innumerable other devices which have
benefited the world to a greater or less extent.

As regards Nikola Tesla, the gentleman
quoted states that he is no scientist. In this
we beg to differ with him, for although it must
be acknowledged that Tesla has only given the
world one important invention he is such a
deep scientist and looks so far into the future
that he is a century before his time. In other
words, some of Tesla's ideas, which are con-
sidered by the general public as visionary
dreams, will be actual facts a hundred years
hence. When, therefore, a foreigner under-
takes to belittle in the language quoted above
two such well-known investigators and inven-
tors as Edison and Tesla, it may safely be at-
tributed to a feeling of envy on his part.

* * *

The Hutchinson Invention.

Important inventions
and discoveries may be
divided into two dis-
tinct classes, first where
they benefit mankind

in a commercial way, and second where they
tend to relieve suffering humanity. In the
latter category is to be found the Roentgen
ray and various electrical methods of treating
diseases as well as the device perfected by a
young electrician by the name of Hutchinson
for making the deaf hear. Mr. Hutchinson
has been working diligently on his invention
for several years now, one of the first experi-
ments having been made on deaf mutes in
Mobile, Ala., as far back as April, 1899. At
that time the wonderful results attained by
Mr. Hutchinson were referred to in these col-
umns. The inventor is now in this city where
he has given practical demonstrations of the
working of his apparatus before a distinguished
body of specialists, members of the New York
Academy of Medicine.

The instrument, by means of which striking results have been obtained, consists of two rubber ear pieces held together by means of a spring, much resembling in appearance the headgear made use of by central telephone exchange operators, and a metal breastplate on which is fixed, just in front of the mouth of the wearer, a transmitter apparently quite similar to the type found on many telephones. This transmitter, which is made of hard rubber, is so pivoted that it may be turned in any desired direction, or in other words, toward the source of any sound which it is desired to hear. The current for operating the system is derived from a number of battery cells, a switch located on the breastplate permitting the wearer to cut the apparatus in or out of circuit at will. Another switch is also provided for controlling the amount of current passing through the circuit, and consequently the intensity of the sound produced. The wiring and switches are furthermore so arranged that if it is found that one ear of the patient is more sensitive than the other, the volume of sound can be adjusted accordingly. From the above general description, it will be seen that Mr. Hutchinson's invention resembles in many respects the loud-speaking telephone.

From demonstrations that have recently taken place in this city it would seem as though the Hutchinson device, not only enables a deaf mute to hear, but so stimulates the aural nerves that a patient recovers, at least partially, his lost sense of hearing. The possibility of relieving the infirmity of the deaf mute is, therefore, the hope of the professional fraternity, and to that end, now that the way has been pointed out, their energies are to be directed. If success crowns their effort, one of the most unfortunate afflictions that the human race is heir to will have been alleviated.

* * *

What is Being Done in India in the Electrical Line.

In a recent edition of the N. Y. "Times" there appeared a very interesting article by the Simla correspondent of that paper on the use of electrical machinery in India. It seems that matters electrical have been neglected in that country until quite recently, in spite of the fact that water power abounds, and millions of horse power are running to waste. These streams are fed from the vast snow fields of the Himalaya range. Unfortunately for the inhabitants it is only possible to utilize the power of these waters at a convenient distance from the foot of the hills as all the towns are far out on the plains. The correspondent says: "In time, no doubt, we shall adopt the American principle of bringing the towns to the power, as in the case of Niagara and other places. But there are other rivers in India besides those flowing from the Himalaya which can be utilized for power purposes. There is now in course of execution a scheme for the utilization of the power running to waste in the River Cauvery, which would be deemed of merit in America itself. The Cauvery rises in the northern portion of the native territory of Mysore, and flows partly through Mysore and partly through British territory, to the Bay of Bengal. The falls on the river which it is now proposed to utilize are 320 feet in height, but for a mile above the actual falls the river runs in a series of rapids,

dropping a hundred feet in that short distance. The drainage area of the river above the falls is some 6,000 odd square miles. The maximum flood discharge is close on 250,000 cubic feet a second, the ordinary discharge during the rainy season is 180,000 cubic feet a second, and the lowest recorded discharge, during the extreme dry season is 95 feet.

"It has long been recognized that here was a source of power which it would be almost criminal not to utilize. But, unfortunately, there have hitherto been serious drawbacks to all schemes for the use of this power running to waste. The falls are situated in an out-of-the-way corner of the State, far from the railway, and the climate is so unhealthy that it was out of the question to establish factories close to the source of power. A couple of years by, however, a Royal Engineer officer, whose services had been lent to the Mysore State, conceived the idea of utilizing the power at the Cauvery Falls to run the Kolar gold fields, ninety miles away, in a direct line."

It is stated that this scheme was strongly backed by the Prime Minister of the native State, and was approved by Lord Curzon. The officer in question visited this country in order to see how similar installations were worked, and on his return to India planned a scheme, which is now in process of execution. It seems that the Kolar gold mines are a great distance from the coal fields, and their fuel bill is consequently very heavy. "Power, in fact," says the writer of the article, "costs them £30 per horse power per annum. It has been ascertained that electrical power can be transmitted to the gold fields from the Cauvery Falls at a much less figure than this, and a contract has been entered into with the mines to take 4,000 horse power at a rate per horse power per annum varying from £20 in the first year, £18 in the next three years, £14 in the fifth, and thereafter £10 per unit for a period of five years. The mines calculate to save more than £500,000 by this bargain during the next ten years.

"The Mysore State, on the other hand, estimates that for a capital outlay of something under £300,000, the cost of the installation, and after allowing for depreciation and wear and tear of plant, profits to the extent of £524,000 will have accrued at the end of the ten years' period for which the contract with the mines has been made. Thus both parties will benefit to the tune of upward of £500,000."

Most of the electrical machinery for the plant, so it is understood, has been obtained from the United States, there being, as the correspondent states, "no British firm competent to supply it," which should prove rather unpleasant news for British manufacturers.

MR. THOS. A. EDISON has been interviewed regarding his latest invention. He says: "My new storage battery will be about half the weight of those now used in automobiles. I do not use lead in the battery, but I do not care to state at present what metal is employed. The battery is permanent and does not suffer from depreciation. Of late I have been giving my attention almost exclusively to chemicals. I have discovered a new reaction in chemistry which is going to prove very valuable. The capital stock for my new storage battery has been subscribed by the presidents of three trunk lines. There is not a share of the stock on the market. I have perfect confidence in the practical success of my

new invention, and the first demonstration of the process will be made at the Pan-American Exposition. I will build a factory at Menlo Park for the manufacture of the batteries. I have made fortunes for many people out of my inventions. This one is going to make a fortune for Edison."

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

A MAMMOTH plant for the manufacture of insulated copper wire is to be built in Newark, N. J., it is said, at a cost of \$1,000,000, by a company of New York capitalists, some of whom are connected with the Steel Trust. A patent process for insulating the wire is to be used, in which, it is said, there is an immense saving over the present process. Several thousand hands will be employed.

It is reported that a rich deposit of copper has been discovered in Chautauqua County, N. Y., at a depth of 500 feet. Jamestown capital is interested and a shaft at a cost of \$57,000 will be put down.

BRITISH business men evidently believe that there is some good in combination in spite of their condemnation of trusts of the United States. It was officially announced, says the New York "Tribune," that the Thames Iron Works Shipbuilding and Engineering Company, Messrs. Siemens, Mather & Platt, and the Brush Electrical Engineering Company, are to close their ranks and to combine their forces in order to make a fight for British industry. One immediate consequence of the formation of this British trust is that designs have already been prepared for electrical equipment of two underground railway lines of London and the construction of another one.

A DISPATCH from Paris, France, announces that M. Naudon, a scientist, has found means of producing X-rays without electricity, by exposing a metal plate to the rays of a violet end of the spectrum.

J. PIERPONT MORGAN lately purchased the plant of the Liberty Electric Light & Power Company and has presented it to the Loomis Sanitarium for consumptives on Liberty Heights, two and a half miles from Liberty, N. Y. The price paid for the plant was about \$40,000.

FROM New York to Philadelphia for only 50 cents. This is the alluring promise which will be a reality before Christmas, according to Mr. A. L. Johnson, the trolley magnate, who says in his latest bulletin to the press: "I will have electric cars running through from New York to Philadelphia at the rate of 50 miles an hour before next Christmas. A regular schedule between Trenton and New York will be entered upon on July 1 next. The Philadelphia, Trenton and New York Railroad Company is about the last link in my through system. I have secured the line from the terminus of the Trenton, Lawrenceville and Princeton Railroad, already constructed to the New Jersey side of the Calhoun street bridge, across the Delaware River. To avoid any controversy over this important point I bought the bridge outright. New Yorkers will be able to travel to Phila-

delphia over our lines with great speed at a cost of only 50 cents, as against \$2.50, the present railroad fare.

THE Bay Counties Power Company is stringing 10-inch steel cables across Arm Bay, from Port Costa to Benecia, Cal. There are towers on either side 250 feet high and the cable will have a single span of 4,400 feet. They are the largest cables in the world carrying power, and also the longest unsupported span. They will carry a current of 20,000 volts, which will be delivered at Oakland shortly.

A DISPATCH from Washington dated April 3 states that Prof. Willis L. Moore, chief of the Weather Bureau, has returned from an inspection of the wireless telegraphy stations at Cape Henry, Va., and Hatteras, N. C. These stations are forty-seven miles apart, with no land between, and messages are being exchanged daily. Elaborate experiments will be conducted later in the season.

DR. JOSÉ MARIA BORGIA, former Consul General and Acting Minister to the United States from Ecuador, has been in this city some time and before leaving for home said: "I have been in this country making arrangements for the shipment of machinery for the better development of our gold fields. In a few months we will have more than 300 dredges there worked by electricity. We consider our gold fields, when fully operated, will prove the richest in the world."

Two of the large turbines were started last week at the power plant of the Trenton Falls, N. Y., Electric Light & Power Company. The test was simply to ascertain the quality of the work that has been done on the wheels, each of which weighs 22,000 pounds. The wheels ran smoothly and showed perfect balancing, proving that the construction was a successful piece of work. Each generator with its wheel will weigh 60,000 pounds, and each generator will produce 1,700 horse power of electrical energy. Everything worked to the best satisfaction of those who witnessed the trial.

THE committee on guide boards appointed by the Automobile Club of America has adopted the Bessemer steel sign post and work is being pushed forward so rapidly that it is expected the erection of the posts will be completed along the main highways early enough to facilitate the summer runs and tours.

THE Pierrefitte silver mine, which is situated in the French Pyrenees, about 14 miles from Pau, is now worked electrically. Water power is utilized for driving the generators. Mr. E. H. Davies, who acted as expert in connection with the equipment, has just described the electric power station before the Institution of Mining and Metallurgy in London. He told the following interesting story: In December last a strange accident happened to the 100 hp. motor. The motor man reported that when restarting after dinner a flash of fire enveloped the collector, whereupon he shut off the current. There was nothing visibly wrong with the machine, but the same thing recurred. Thereupon the motor was more closely examined, and finally the smashed remains of a rat were found inside the armature, where he had apparently taken refuge during the dinner hour, and his blood had

caused a short circuit across some of the collecting wires. This trifling incident led to the machinery being idle for a week for repairs.

A CABLE dispatch states that the first electric street car line within the limits of London began running on April 4.

THE annual report of the General Electric Company will probably be issued some time this week, as it has already been passed upon by the directors. It is understood that a circular will be issued, simultaneously with the report, in which the plan of the directors for the restoring of the old capitalization will be made public. Preferred stockholders will be given new stock in exchange for their holdings and all of the preferred stock will be retired.

A NEW branch of the electrical engineering course has been started at Armour Institute of Technology at Chicago. It is designed to fit students for work in telephone construction in a way that has never been attempted in a technological course in that city. L. P. Dickinson, an institute instructor, with practical experience in the work, will have charge of the course.

THE city of Pittsburg, Pa., has begun the taxing of all vehicles and the issue of licenses at the following rates: Six dollars for a single horse and wagon or a single-seated automobile, \$10 for a two horse wagon or a two-seated automobile, and \$12 for a four horse wagon or automobile, if more than two seats. Since March 1, fifty cents extra has been added to these rates.

It was stated recently that the final papers are being adjusted with a view to the construction of an electric traction system in Barbadoes, West Indies. New York parties are said to be approaching certain Canadian capitalists for the purpose of jointly building and operating the road, which will entail an expenditure of nearly \$500,000. The road will be the first electric one in that part of the world.

MR. K. YONEKRA has been in this country for some time inspecting the latest types of mining machinery and has already placed orders for a considerable quantity of American apparatus, which will be introduced in the coal mines of Japan. In speaking of the development of the coal mining industry in Japan, he stated that it had been delayed by the fact that the gas and fire-damp in the mines of Japan are much more common and deadly than here, and that mine catastrophes were of very frequent occurrence. He gave an instance by saying that there had been several explosions in the mines of his company during the past two months, one of which occurred on March 12 and caused the death of twelve men. The company is now engaged in placing electric lights throughout its mines and hopes in that manner to do away with the danger of explosions from miners' lamps.

CONSUL GENERAL GUENTHER, in a report to the State Department from Frankfort, says that, according to German press reports, the project involving the construction of an electric railway between Rome and Naples, which was agitated some time ago but afterward

abandoned, has been revived. Two Neapolitan engineers, it is stated, have prepared new plans for the road, which have been submitted to the ministry of public works. The contemplated railway will run along the shore via Cancelli, Mondragone, Minturno, Formia, Fondi, Terracina and Cisterna to Rome, with a branch line by way of Marone and Giugliano, to Capodimonte, the summer residence of the king. It will be double-tracked, with a total length of 135 miles.

A PITTSBURG dispatch says that representatives of the larger manufacturers of glass lamps and electric glass ware have agreed to enter a "combine" with a capital of \$5,000,000 or more, under a New Jersey charter. The companies interested sell upwards of \$6,000,000 worth of goods annually.

A RECENT issue of the "Engineer," London, states that M. Romanoff constructed at Gatschina, twenty miles from St. Petersburg, Russia, during the summer of 1900, a small electric railway on a system which he had invented, and the results were thoroughly satisfactory. He has now drawn up a project for constructing an electric railway from St. Petersburg to Moscow. It has long been well known that the existing Nicolas Railway, connecting the old and new capitals of Russia, and 404 miles in length, is unable to cope with the traffic. The authorities entertain the idea of separating the passenger traffic from the goods traffic, and for this purpose it is said that two other tracks are to be laid down. However, M. Romanoff has now come forward with a proposal to construct an electrical "hanging railway," at a cost of 98,000,000 roubles, which shall take the place of increasing the carrying capacity of the present line by the addition of two tracks.

OWING to the sporadic appearance of small-pox in a Michigan town recently the usual Sunday morning services of the churches were rendered by telephone. In the morning the local exchange made a circuit connecting as many of the subscribers who were church members as possible with their respective places of worship, and, at the appointed hour, singing, reading and 15-minute sermons were sent over the wires from the churches.

A CHEAP electric method of producing copper panels, friezes and other building decorations has now appeared. The design is first executed in plaster or wax. This model is then coated with a layer of copper by depositing it electrically. The thickness of the covering can be readily controlled. It may only have the thickness of paper, or it may be an eighth of an inch or more in thickness, according to the character of the service required of it. This process is very much cheaper than the usual one of casting. After the matrix is formed, as above, it can be put through the usual processes for finishing the surface in an artistic manner. Plaster models, such as those used in drawing schools, can be coated with a very thin layer of copper in this manner, when they will withstand a great deal of hard handling. Decorations and designs for outdoor service are especially durable when formed in this way, as the coating is practically impervious to the influence of the weather.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 22.

THE TELEPHONE AND TELEPHONE PRACTICE.

(Continued.)

Referring in this article particularly to line and underground construction I may say that years of experience and operation has caused considerable of a revolution in the methods and systems of outside construction for central telephone exchanges. Companies are gradually seeing the folly and expense of operating under the old-fashioned method of getting a line to the desired destination with the least possible trouble and expense.

By unsystematic and cheap methods of construction, the maintenance becomes a tremendous item of expense. The lesson has been learned that the first cost is not of nearly so much importance for consideration as the cost for maintenance, and the greatest reduction in this can be secured by the application of good judgment in the installation.

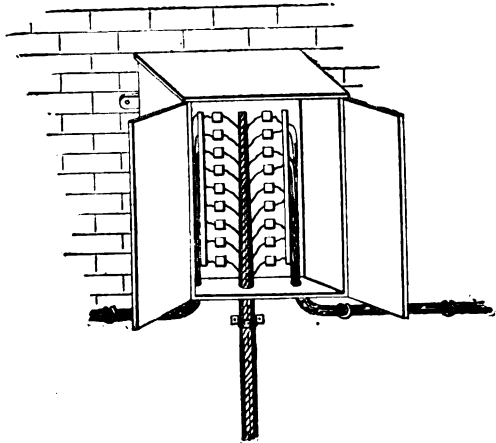


FIG. 1.

For pole line construction, white cedar, chestnut, pine or tamarack poles are generally used, ranging in length from 25 to 40 feet, and are usually set from 5 to 7 feet in the ground. The length of poles and manner of construction may depend to a great extent upon the restrictions and rules governing this work of the municipality through which the line is being run, but regardless of this it is essential to the successful operation of a line that the work be done substantially and according to the rules of good construction.

The most important part of this subject, however, is the equipment in large towns and cities where the lines are necessarily heavy and the obstructions numerous. This work, which is generally a combination of underground and line construction, may be divided into the following recognized classes: Direct Connection, Block System, Pole Distribution and the Ring Terminal, all of which are used in modern and up-to-date work.

DIRECT CONNECTION.

This is the term applied when the underground service is carried directly to the substations without involving the use of any overhead lines. This work is usually done in large office buildings, and a direct cable from the central station will terminate in a suitable

cable box, to which may be connected the individual wires running to each office or, as is very often the case, there may be a house cable connected to junction boxes on each floor and terminating in the same box as the underground cable. In this work there is practically no necessity for fuses or carbon arresters in the cable boxes and consequently they are seldom installed.

THE BLOCK SYSTEM.

A very popular system in Eastern cities is to terminate an underground cable in a suitable cable box (see Fig. 1) attached to the wall of a building in the center of a block. From this terminal, twisted pairs of well insulated wire are run in insulated rings (Fig. 2). These rings, which are iron with a vulcanized rubber coating, are wedged in the walls at suitable distances and constitute a "run" for the distributing wires which radiate from the terminal to each station. This system can only be used to advantage in the thickly settled business section of a city. Very often a terminal of this description is placed on the top of one of the highest buildings in a block and

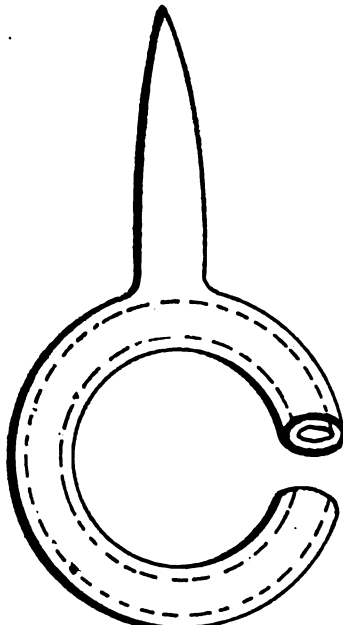


FIG. 2.

the wires run directly from a fixture surrounding the cable box to the buildings where the sub-stations are located.

POLE DISTRIBUTION.

Fig. 3 illustrates the method of connecting a pole line and an underground cable. The underground cable terminates in a cable box located directly under the cross arms. A cable box which acts as a junction between a pole line and an underground cable should always be equipped with fuses and "ground" protectors to prevent any lightning or foreign currents getting into the cable and causing damage. The "crossconnecting" wires which lead from the cable box to the lines should never enter the box except through a hole in the bottom. This is to insure against weather effects.

The ring terminal system, which has recently become popular and is being very extensively adopted, possesses advantages over most other methods of distribution.

Fig. 4 illustrates a distributing pole having the underground cable terminating in a cable box on the top of the pole. This terminal is equipped with protectors and fuses and covered with a galvanized iron case, having much the

appearance of an inverted ash can. Surrounding the terminal head is a hoop of iron having insulators mounted, and to these are attached the distributing lines which are spliced to twisted pairs connecting them to the cable terminals. These terminal poles are usually very high, and when erected in convenient locations make a very satisfactory distributing medium and constitute a system almost entirely independent of building attachments, etc.

It would be out of the question to try in one article to go into detail on the subject of line and underground construction but the

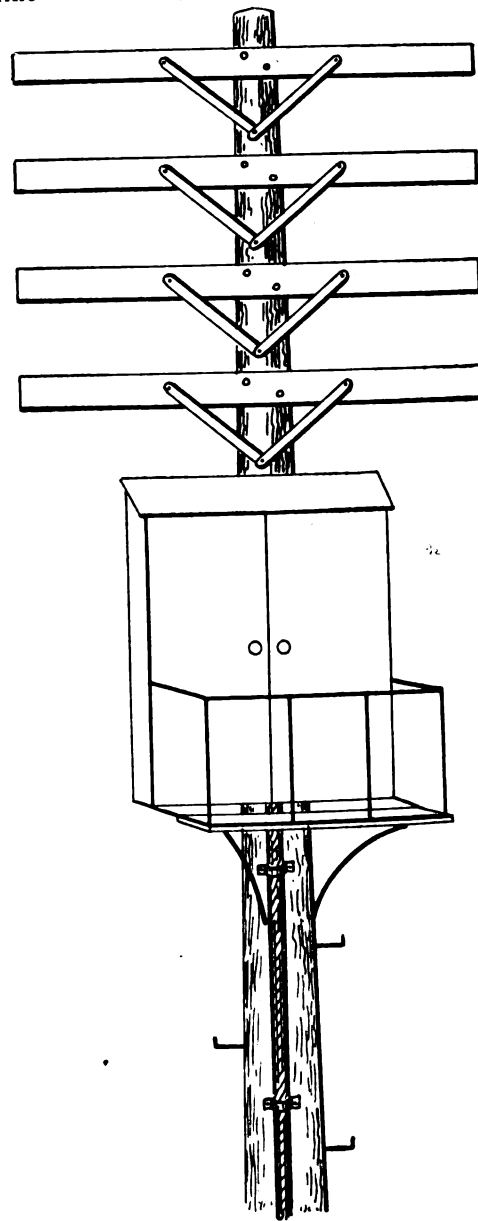


FIG. 3.

following are a few important points to be remembered. In bringing lines into a building always leave a loop in the wire (known as the "rain drop") just before entering (Fig. 5). The holes through which the wires enter should be bored, slanting downward toward the outside.

If a protector is to be placed on a line arrange to place it as close to where the wires enter the building as possible, and until the wires reach this protector they should not touch any wood but be supported by porcelain knobs. A ground wire attached to a protector should run as straight to the "grounding" point as possible and the fewer turns and angles described the better.

Never connect a line to an underground cable without placing a fuse and ground protector where they join.

Telephone cable should always be twisted pairs. Never use straight conductor cable even if only for a few feet.

All lines which are at all liable to induction should be transposed frequently.

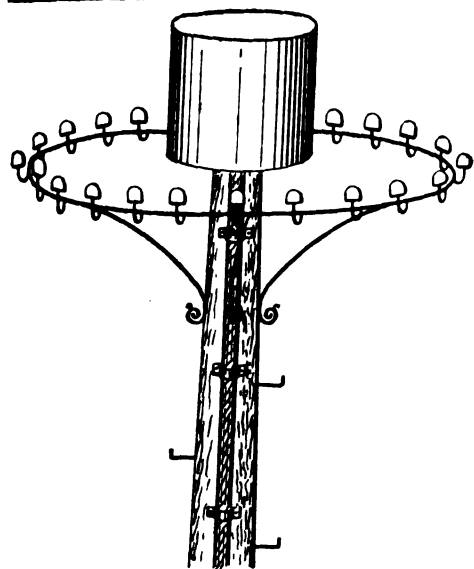


FIG. 4.

Never solder hard drawn copper line wire as it softens the wire and makes a weak spot in the line. Use a special splicing device sometimes called a McIntyre sleeve. This is made of two pieces of copper tube brazed together. The tubes are of such size that the line wires slip easily into them. The ends of the wires are slipped through the tubes from opposite directions and are turned up and cut off. The joint is then twisted, which draws the tubes so closely around the wire as to insure a good electrical contact.

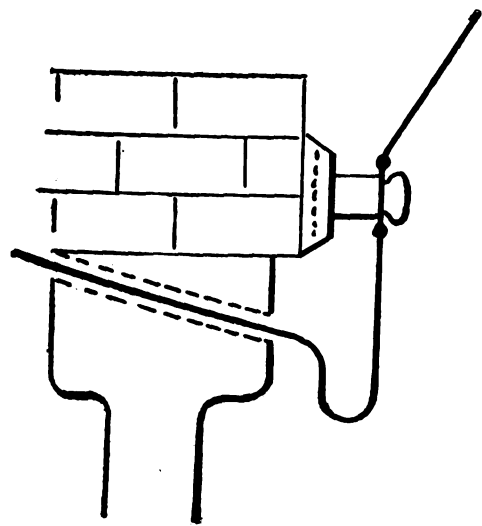


FIG. 5.

Wires attached in cable boxes should be soldered. Do not depend on screw or clamp nut connections.

Article No. 23 will be entitled "The Telephone and Telephone Practice" (continued).

The Utilization of Peat as Fuel.

A scheme for the transmission of electric power and its distribution on an enormous scale is to be tried in North Germany. It is proposed to utilize peat from the great peat beds there as fuel for the generating of electric current that will be distributed to manufacturing centers. It is estimated that an acre of turf ten feet thick contains a thousand pounds of dry peat, and that this is equivalent to 480,000 tons of coke. It is stated that an amount of peat equivalent to 300,000,000 tons of pit coal is available.

COMPARATIVE TESTS OF STREET RAILWAY MOTORS.*

BY C. H. BIGELOW.

In reference to the experience of the bureau of surface lines of the Boston Elevated Railway Company with four-motor equipment, I would say that the Department of Motive Power and Machinery has made a number of comparative tests in regard to this matter, and from the results that we have obtained we do not consider that they would be advisable under our conditions. This does not say that the use of four motors might not be the very best thing under other conditions, but simply applies to the conditions as we have found them in our service.

We equipped one of our standard 25' box cars with four motors and a similar car and truck with two motors of the same kind. The four motors were wired into a K-10 controller, so that each pair was in multiple notches of the controller, all the notches were in multiple.

We found that the four-motor car took considerable more energy to cover the same distance than did the two-motor car. In one run the increase in energy, as measured by wattmeters on each car, was about 50 per cent. The weight of the four-motor car being about 18 per cent. greater than the two-motor car. In this particular test the motormen were not the same; one car following the other over the same route, but other tests made with the same motorman also show large increases in the energy used.

The four-motor car would accelerate faster and would carry more load than the two-motor car (as would naturally be expected). While this quicker acceleration would mean quicker time could be made, provided there were no slower cars in front, yet under the circumstances of the great number of cars operated and the fact that we can now make as fast time as is safe or allowable to do—except perhaps in some places in the suburbs—seemed to show that the quicker acceleration was not necessary, especially at the cost of extra expense for power and equipment.

We made some comparative tests between the two equipments over a stretch of straight level track of about a half mile in length, running both with and against the wind, averaging the results to neutralize the effect of this factor. These tests were made with the same motorman, and in most cases hauling an old horse car weighing about 6,000 pounds, to which was attached a tachometer for getting the instantaneous speed. The track was marked in fifty foot lengths and the cars equipped with areometer and voltmeters, but not wattmeters. Three second readings were taken, and the results showed that the four-motor car only required about 68 per cent. of the time required by the two-motor car to reach a speed of fifteen miles per hour, but took 64 per cent. more current to do it; but as this current was used for a shorter time it only required about 12 per cent. more energy. On other tests, however, we found that it required 27 per cent. more energy for the four-motor equipment to reach this speed. The four-motor car covered the distance of 500 feet in about 11 per cent. less time than the two-motor car, in one set of tests. In other cases we found that the four-motor equipment used about 36 per cent. to 50 per cent. more energy in the

same given time, although it would cover about 20 per cent. more space in the same time.

These tests were made simply during the time of acceleration, and do not refer to the speed that could be reached after the acceleration ceased, which would depend upon the size and make of the motor. The fact that we have the losses due to four motors in place of two would probably explain the increase in power consumed.

There is one thing that the four-motor car does excel in, and that will be conceded by all, and that is the traction. The entire weight of the car is available for adhesion, and the draw bar pull is the maximum that can be obtained upon any given rail, provided the motors are powerful enough to slip the wheel. We have found by experiment (and it agrees with the experiments of many others) that about 25 per cent. of the weight on the driving wheels, on good clean tee rails, is available for draw bar pull, or tractive effort. If you attempt to haul more than that your wheels will slip. In some tests that we made in the subway, in attempting to haul a loaded trailer up the 8 per cent. grade, with various trucks, in all cases where the draw bar pull, or tractive effort, due to the weight of the car and trailer on this grade, the train resistance, etc., exceeded about 25 per cent. of the weight on the motor axles, the wheels slipped, and it was impossible to ascend the grade; while where this draw bar pull was less there was no trouble in climbing the hill. In one or two cases the draw bar pull was just about 25 per cent. and the cars went up with the wheels slipping, but we found it impossible to get up with them the second time. This was probably due to the wheels becoming highly polished, and so having less adhesion for the rail. The power of adhesion is supposed to be due to the minute irregularities of the wheel and rail interlocking. In case the wheel and rail become highly polished these little irregularities are smoothed off, and so we have less interlocking effect and less adhesion.

In the case of the two-motor car before mentioned, both motors were mounted on one truck and about 60 per cent. of the weight of the empty car was carried by the motor axles. This per cent. of the total weight will become less as the car becomes loaded, and of course is quite different from the 100 per cent. which always remains 100 per cent. of the four-motor car.

This question of traction can be improved for two-motor cars by means of maximum traction trucks, where a larger proportion of the weight of the car is carried on the motor axles than on the trailer axles, and also by the device of hanging the motors out from the trucks, instead of between the axles, and the per cent. available for traction brought up to from 66 to 74 per cent.; so the advantages of the four-motor truck in this respect is somewhat reduced.

The claim is often made that the use of four motors will reduce the cost of maintenance. I do not think this would be so under the condition of four motors in place of two, the combined power of the four being equal to that of the two, but if you have a line where the load is too much for two motors and the two-motor equipment is being rapidly baked out, and you put four motors of the same size, practically doubling the power on the car, and thereby reducing the load on each motor and the heating as well, the life of the motors

* Paper read at the February meeting of the New England Street Railway Club, Boston.

should be very much increased. The cost of maintenance would be apparently cut down, but you have more parts to look after, and if the four-motor equipment gets loaded to the same extent as the two motor has been, the cost per motor would be the same.

And the fact that these motors were the same size, of course we had double the power, and with the four motors we were running the four motors away down on the curve, where the losses would be much greater.

As already mentioned, the conclusions to be drawn from these tests would apply simply to our conditions and not necessarily to other conditions, or to conditions that might arise in the future in our own service. Every problem of this sort is an engineering problem and should be looked at from an engineering standpoint. We cannot take the results obtained from a series of tests made under certain conditions and draw conclusions to fit every case. When we come to the conditions of larger, heavier cars used for interurban service, over long and difficult grades, and the necessity of making quick time, the question of two or four motor equipment should be carefully looked into, and the question of traction and the ability to make time on a poor rail are often very important considerations; and so the question whether to use two or four motor equipment should be decided for each particular case by competent engineers after careful consideration.

NOTES ON THE ELECTRICAL TRANSMISSION OF POWER IN COAL MINES.*

BY H. RAVENSHAW.

The object of this paper is to discuss the special features met with in electric power plants in coal mines, and to give a record of difficulties and mishaps which have come directly before the notice of the author during the last ten years.

A great many of these plants are now in use, and are doing good work all over the country, lighting, pumping, haulage, and coal cutting being the principal uses to which electricity has been put.

LIGHTING.

It is usual to employ a separate plant for lighting, as the lamps are required in the pit night and day. A pressure of 220 volts is usually employed for the lighting circuits and from 300 to 800 volts for the power.

Underground engine rooms, which are at a considerable distance from the generating station, are often lighted from the power mains with several lamps in series. The light is generally very much appreciated, especially at the shaft bottom, and at landings where there is often a good deal of shunting carried on. Where the mine is dry, simplex steel tubing can be used to great advantage in places where there is not likely to be a fall of roof. There is an immense amount of primitive wiring in use, it being quite usual to run the wires on insulators and for the workmen to bare the two wires and hang a lamp across wherever they want it. This is, of course, only done in the parts of the mine which are not fiery.

Inclosed arc lamps are very suitable for screens and pit heads, as well as for the pit bottom.

* Paper read before the Institution of Electrical Engineers, London, Eng., March 28, 1901.

GENERATING PLANT.

Very low steam pressures are usually employed at collieries, and, coal being comparatively cheap, the steam engines are often of a primitive pattern. Condensing plants are seldom used.

Old winding engines are very often employed, and have the advantage of being extremely reliable; as a rule, however, they do not govern at all well.

For power the units are usually from 100 to 200 ihp. and for lighting 50 ihp. In the best plants Corliss and vertical engines, with fly-wheel governors, are employed. These drive the dynamos with ropes or belts.

Some of the best mines, however, are employing higher steam pressures, and vertical high-speed direct coupled sets.

The most important requirement is absolute reliability, as spare plant is seldom put down, and the machinery often works for at least 16 hours a day.

GENERATORS.

Owing to the fact that non-condensing steam engines are used, there is always a great deal of steam about the surface works of a colliery, and this, combined with the immense amount of fine coal dust, covers everything with a film, which is by no means a good insulator.

For this reason it is not advisable to employ dynamos which have internal ventilating spaces, and in any case all insulating materials have to be of the very best quality.

The greatest care has to be taken with spare machines and armatures, as these are liable to get very damp.

The author has known armatures which were not suitably insulated to break down one after the other, and this is generally found to occur on damp days in January or February.

Exactly similar machines which were working underground, where everything was very dry, gave no trouble whatever.

The load on the generators is likely to be extremely variable, there being as a rule only two or three motors on the circuit, which may all be stopped at the same time. It is quite usual with haulage for the load to vary from 25 per cent. over-load to open circuit in a very short space of time. It is, therefore, most important that the generators shall run without requiring any attention to the brushes. One man as a rule looks after a fan engine and all the electric light and power engines and dynamos, and if the machinery is suitable he has a very easy time.

SWITCHBOARD.

Owing to the atmosphere being charged with damp coal dust, the switchboard must be thoroughly insulated and must be fire-proof. In a switchboard largely adopted by the author, the slate slabs are thick and rest on a low wall of glazed bricks, the top being supported from the wall of the building by iron brackets. The only woodwork is a strip of teak along the top of the slates, fastening together panels of the same potential. The slates have the edges beveled, and there is no wood or metal framework.

Owing to the fact that single armored cables are generally used, any sudden break sets up an enormous tension on the insulation, and it is best to employ massive slow-break switches of the simplest character. A most important instrument for the switchboard is a megohm-meter, arranged to read direct the in-

sulation resistance between either pole and the earth.

A log is kept of the insulation, and any leak put right as soon as possible. Where men's lives depend to a great extent on an absence of leakage, it is of the greatest importance that everything should be kept in first-rate order.

CABLES.

For shaft work there does not seem to be anything better than Callender's Armored Vulcanized Bitumen Cables, and when these are protected from falling objects and are kept well coated with Stockholm tar, they will last a very long time. The cables are almost always carried down the down-cast shaft, as the fumes and steam in the up-cast shaft are very injurious to the armoring. The cables should be so fixed that they will not be struck by any corves or other trifles which have a habit of falling down the shaft.

Underground cables are generally suspended from the props which support the roof; they are hung fairly slack and should be suspended by loops of yarn or leather and not nailed up with cleats. If thus supported, in case of a fall of roof, the cables fall to the ground, and are not so likely to be cut through.

Ordinary rubber and lead-covered cables are often used, but a good armored cable is greatly to be preferred.

All joints should be made in proper joint boxes, as solder cannot be employed, and a single pole switch should be fitted on each conductor wherever there is a junction. Double pole switches should not be used, but single pole coupled externally. These switches should be entirely lined with slate, and made so that there is no possibility of an arc being started to the case.

The switches should be made so that they will break the circuit with certainty in case of a short circuit.

SWITCH GEAR FOR MOTORS.

Where the cables enter the underground engine-room, they should be connected to two single pole switches, similar to those mentioned in connection with the junctions.

It is most important that the shunt circuit of the motor should not be broken, as the extremely high tension at breaking causes a vicious spark and puts tremendous stress on the insulation. By far the safest plan is to connect permanently across the shunt coils a non-inductive resistance of about twice the resistance of the fields. The current used is very small, and the field circuit can be broken with impunity.

The author has known the shunt coils of a motor to be left on and to be broken by switching off at the surface, thus causing an enormous stress on the insulation of the mains. All series coils should also be fitted with a similar resistance. Precautions such as this reduce the flash from the switches, or, in case of a broken cable, to a very great extent.

MOTOR STARTING SWITCHES.

If a good double pole break is arranged where the cables enter the engine room, a single pole starting-switch can be employed. This is rather important, as the parts of opposite potential are kept well apart. The author has employed liquid switches with a good deal of success; but it must always be remembered that, where they are used for regulating, steam is given off and ventilation must be allowed, so that leakage is not caused by the condensed steam.

In any case, all resistances should be made

so that they will carry the full working current, as they are sure to be used some time or other for regulating.

The cones of liquid switches are of either iron or lead, and should be made so that they can be easily examined and replaced.

Where there is gas, all switches must be entirely inclosed.

MOTOR.

There appears to be a fairly general opinion that there is a great deal of danger from the explosion of gas ignited by the sparking at the brushes, and a number of experiments have been carried out which do not seem to have proved anything one way or the other. Whether this is so or not, it is perfectly obvious that the heat from a burnt-out armature or the arc from a broken circuit would be quite sufficient to ignite gas, and where there is any chance of gas being present it is necessary that the armature and commutator at least, if not the fields, should be inclosed in strong gas-tight cases. All the terminals should be made so that cables cannot be accidentally pulled out, and the machines should be of such construction that they will pull up at once in case of a bad leak or short circuit. It is well known that a gramme armature will go on running for some time with a burnt-out coil, all the time doing itself a very great deal of damage and developing a quantity of heat. A drum armature, however, in which the conductors of opposite potential are close together, will stop at once if there is a short circuit in the armature, and if proper fuses are fitted the machine is at once cut out. This is a most important feature in this type of machine, and gramme armatures should never be used for any underground mining machinery.

Totally inclosed machines are by no means in favor among colliery managers, as they are difficult to keep clean and to inspect, and the general opinion seems to be that an open machine is to be preferred, precautions being taken that the engine-room is kept free from gas.

Inclosed machines are certain to be run some day with the covers loose or entirely off.

It is possible to obtain motors which will not break down and which do not spark at the brushes, and with careful supervision and an organized testing of the insulation from the switchboard in the generating station, there should be no danger from fire or explosion.

PUMPING.

The advantages of electric motors for this work are obvious, and a large number of pumps are in use. Compound motors are generally employed, as they will not run away if the pump loses its water. Owing to the damp places in which they usually work, pump motors are often entirely inclosed, and shunt wound machines under these circumstances are apt to give trouble owing to the resistance of the fields rising as the machine gets hot. This increases the speed and the armature current. The addition of a fair amount of series winding prevents these difficulties from arising.

HAULAGE.

The author cannot quote a single instance in which electric locomotives have been employed in coal mines. Wire rope haulage appears to be almost entirely employed.

With continuous rope haulage the motor usually runs at a constant speed, the rope-pul-

leys being started and stopped by means of clutches.

With single rope, and main and tail haulage the electric motor is shown to advantage, the smoothness of starting and complete control over the speed, as well as the ease of reversal, giving an extremely handy hauling engine.

COAL CUTTING.

The motors employed for coal cutting are usually series wound, and are subject to extreme variations of load and to very great shocks. They are entirely inclosed, and are consequently liable to get very hot. It is, in fact, difficult to imagine a more trying load.

With these motors it is, of course, imperative that they should be entirely inclosed, both for the protection of the armatures from falling coal and to keep out the coal dust.

It is most important that effective switches and cut-outs should be fitted at the junction where the motor cables are carried from the main cables, so that, in case of damage to the flexible cables or of burn out in the motor, both poles are quickly cut out.

GENERALLY.

The amount of bad or unsuitable work to be found in colliery installations is very surprising, and it is apparently only due to the strict supervision and high order of intelligence to be found among those in responsible positions in collieries that there are so few accidents.

With good work electric power transmission is an immense boon, and there should be a very great field for extensions.

As the author has not employed any multiphase motors in mining work he is not in a position to discuss their use. Many of the points raised, however, will apply to both systems.

As one mishap gives more instruction than many years of steady running, a list is given herewith of a number of accidents and defects which have come directly before the notice of the author. For obvious reasons the actual localities are not given:

A. Engines.—A stud sheared which fixed a flywheel governor in place. The engine ran away.

B. Dynamos.—Three armatures broke down one after the other, stopping the pit for three days. The first armature broke down. The spare dynamo had not been run for several months and on starting up burnt out. The spare armature had been kept in a damp place and broke down at once. All these armatures were only insulated with compressed paper.

C. The brushes for three dynamos cost £40 in one year, and armatures constantly broke down owing to over-heating. The brush-holders were originally few in number with large carbon blocks. These were changed for a number of holders, each carrying a small block of carbon. After this alteration the machines ran well and a set of carbons now lasts for many months.

D. A number of instances of short circuits have occurred, owing to the ventilating spaces in the armature becoming filled with coal dust. The armatures often broke down after they had been standing for some time. The coal dust seems to absorb moisture.

E. Switchboard.—An arc was started at 600 volts between two contacts about 1½ minutes apart at opposite potentials on a switch connected to a megohm-meter. The base of the switch was ebonite, and the leak was due to a fine layer of damp coal dust.

F. In another case a voltmeter was entirely burnt out, evidently from the same cause.

G. While there was a heavy earth on the mains an arc was started between a switch on the engine-room switchboard and part of the metal framework supporting the slate. This was evidently due to coal dust.

H. Cables.—Two armored bitumen cables were laid in a wooden trough, which was close to a leaking steam-pipe. Both cables went to earth within a few hours of each other. The trough has since been filled with bitumen and no further trouble has occurred.

I. A nail fastening up a cleat had evidently been driven through an armored cable, passing through the insulation but not touching the conductor. This finally came in contact with the conductor, and, as there was a bad leak but not a dead earth on the other pole, an arc was set up and a very serious fire only prevented by the fact that the assistant manager was close by and telephoned to the engine-man on the surface to shut down.

J. A common twin cable was carried down a shaft for lighting a mine; 60 volts were lost in this cable, the volts at the surface being 110 and in the mine 45 to 50.

K. A runaway train of tubs cut through one of the cables. The accident happened close to a box containing a double pole branch switch. The drag on the cables broke the marble bases of the switch into several pieces and an arc was started to the iron case.

A number of cases have occurred where runaway trains have cut the armored cables clean through.

L. Motor Switches.—Owing to there being no stop inside the switch, and the handle being put on the wrong way, a double pole switch was carried back too far and a short circuit effected between opposite poles.

M. A main regulating switch was not marked, and was arranged to switch off left-handed instead of right-handed. An accident occurred to the gear, and the attendant, instead of switching off, switched on to full speed.

N. A double pole inclosed switch was fitted with a fiber arm. The insulation of the fiber broke down and caused a short circuit.

O. A single pole inclosed switch had a cast-iron arm supporting the moving contacts. The arm broke in switching on, but the contacts remained in position. It was therefore impossible to switch off the current as there was no double pole switch fitted.

P. A gas-tight cover to a liquid switch was fastened by clamps binding the porcelain jar very tightly. The jar cracked when it became hot, and caused a partial earth owing to leakage of the solution.

Q. Owing to insufficient room being allowed for a liquid switch gear, the steam from the solution caused an arc to be started between opposite poles on several occasions.

R. A double pole switch in the shunt circuit of a compound motor worked perfectly well on the surface when tested with its own motor. On being erected underground, at the end of several miles of armored cable, the length of break was not sufficient and an arc carried on between the contacts.

S. Motors.—In several cases a gramme armature has gone on running with a short circuit in the armature, burning the armature to a cinder.

T. No record has been found of a drum armature running on with a short circuit. Several cases have occurred in which the armatures

have pulled up at once from a short circuit, the damage to the coils being very small.

U. A cable was brought from the magnets of a large shunt motor to a switch in another part of the engine-room. This cable was loosely run, and was accidentally pulled out of the connection. A tremendous flash was the result, the commutator was badly damaged and the fuses on the surface blown.

V. The shunt circuit of a compound motor was broken, and the motor ran away.

W. After some repairs the series coils of a compound motor were connected up the wrong way. The machine gave a great deal of trouble and it was some time before the mistake was found out.

X. A shunt motor driving a pump was driven by a shunt dynamo through a long line. The motor was inclosed, and the fields became very hot. The field of the motor being weakened, the current increased, and it was found to be impossible to run the plant for more than two or three hours at a time.

THE SYNCHRONIZING OF ALTERNATORS.*

Of all central station apparatus, probably less advancement has been made in that appertaining to synchronizing than in any other of the many instruments in daily use in a generating station. We are practically in the same position in this matter as we were years ago, with the exception that the voltmeter has very generally taken the place of the incandescent lamp as an indicator. The importance of good synchronizing as opposed to the old haphazard style of throwing the switch in almost anywhere, and allowing the machines to pull themselves in, is daily becoming more recognized, especially in the larger stations, and when we consider the evil effect of perpetual bad synchronizing on a machine in the way of racking the coils and of setting up undue electrical strains in the armature, it is only right that it should be so.

Because very little progress has been made in synchronizing methods, it cannot be argued that the present system is perfectly satisfactory, although of the few that have been tried it is certainly the best.

Synchronizing as it is now performed leaves too much to the skill of the operator; indeed, everything depends upon it. A nervous or unskilled man may cause hundreds of pounds worth of damage by being a second or two late with his shot. This is especially likely to occur in a breakdown, where, perhaps, the machines that are running are heavily overloaded, owing to the sudden failure of one or more of the others.

Under these conditions, synchronizing with the present apparatus is an extremely difficult operation to perform, and calls for the greatest coolness and skill on the part of all concerned. Alternators that are heavily overloaded will sometimes tend to come out of step, which of course is due to the engine, and not to the alternator; the result of this is that the phases shown on the synchronizing voltmeter become very erratic and unreliable, and often necessitate what is known among central station engineers as a "flying shot."

This is always a more or less risky proceeding, but with the present system it is the only one possible in a breakdown. The writer cannot offer any suggestions for what must needs

be a very radical improvement in synchronizing methods, but feels that some of our master minds might with profit devote a little attention to this somewhat neglected point. In a breakdown of the above type it is very usual for the voltage to fall so low that the synchronizing voltmeter becomes useless, owing to its frequently not being designed to read accurately below 75 volts or thereabout. In central stations fitted with this type of synchronizing voltmeter, recourse must be had to the engine driver's pilot lamp, which under these conditions can be of but very little value, owing to its never reaching more than a red glow. To meet this emergency at some stations, in addition to the usual synchronizing voltmeter, a low reading voltmeter has been fitted to the switchboard and used for synchronizing at low volts. It is, of course, quite possible to use a voltmeter that reads over a wide range, but instruments of this type are never so dead beat or so generally satisfactory as those designed to read only on that part of the scale where they are presumably to be used. The old style of synchronizing by an incandescent lamp was extremely unsatisfactory, owing to the great lag of the light behind the voltage, and to the uncertainty as to when the lamp was at its maximum brightness. On account of this latter defect it was never possible to guard against what may be termed a "short phase," that is to say, a phase where the secondary voltage of the synchronizing transformer does not rise to its maximum, but after nearly reaching it, suddenly falls back to zero. Short phases are of common occurrence in synchronizing, and when using a lamp only it is practically impossible to tell them from good ones; as after the lamp has been flickering up and down for a minute or two the eye cannot discern the difference occasioned by four or five volts. All central station engineers know that short phases are things to be avoided; switching in on one is at the best bound to result in a very bad shot and may, unless the machines are designed to pull in, easily cause more or less damage. A voltmeter is greatly superior to a lamp in this case, but in the negotiation of a short phase it still leaves much to be desired.

The fault of lagging is not only confined to the lamp; the best voltmeter has it, although in a modified degree. The lag in a voltmeter is, of course, caused by the inertia of the moving parts and also by the damping arrangement. In a quick phase the inertia tells by causing the voltmeter to kick, and to momentarily show in some cases a much higher voltage than is across its terminals. This, however, is not of any importance, as a quick phase should never be taken except in emergency.

With the ordinary slow phase, the inertia causes no kick, and the only thing left to experience is to know how much to allow for the lag of the instrument. This, of course, is a variable quantity, depending entirely on the speed of the phase; the quicker it is, the more must be allowed, and vice versa. Some engineers prefer what may be termed a "standing phase," that is to say, one where the synchronizing voltmeter needle rises to the maximum and stops there for several seconds. While phases of this type should be theoretically perfect, they are often in practice found to be anything but desirable.

There is always an element of uncertainty about them; if they slowly move a volt or two

down and then come up again they may be taken with safety, but when the needle stands still with perhaps a tiny quiver they are risky, as the phase may be going back, although the inertia of the moving parts keeps the needle momentarily at the maximum. The result of closing the switch too late is always worse than that of closing it too early. Rather be early than late is as sound a maxim in synchronizing as in everything else. The reason is, that in an early shot the electrical action set up between the machines on the closing of the switch acts in the same direction as the engine which is bringing them into phase; but in a late shot the action is opposed to that of the engine, the motoring current between the machines tends to pull them back into step while the engine is doing its best to pull them out, as is seen by the fact of the synchronizing voltmeter needle going back.

Hot-wire voltmeters are, of course, the best to use for synchronizing; their inertia is small and there is not much need for damping, they have possibly more lag than an electro-magnetic instrument, but the latter is apt to be so violent in its action that its indications are not always reliable. One of the best synchronizers is that made by Messrs. Ferranti and fitted to all their switchboards. In their latest type they connect a couple of low candle-power incandescent lamps in parallel with the synchronizing voltmeter and place them underneath it, and this has the effect of greatly helping the eye to determine the correct moment for closing the switch. The voltmeter used is of the Hartmann and Braun hot-wire type and is very satisfactory.

When lamps alone are used for synchronizing, it is useful to remember that the lower the candle-power the better the result. The lag of the light behind the voltage increases with the candle-power of the lamp, owing to the thicker filament taking longer to attain incandescence. Two-phase alternators are synchronized in the same manner as single phase. The incoming machine is synchronized on one phase, and the linked switches of the two-phases then thrown in together. Of course they could be thrown in separately, as if one phase is in synchronism with the bus bars, so must the other one be, as they are rigidly connected in the machine, and therefore bound to keep the same phase difference. It is better, however, to switch in both phases at once, as, if the shot is not all that it might be, the machines will pull into step much easier with both halves of the armature helping than they would with one alone. The link on two-phase machine switches should, however, be removable, so that if the machine fuse on one phase should blow, it would not be necessary to open both switches to replace the one fuse.

Wireless Telegraphy to Replace Carrier Pigeons.

It seems that almost before they have demonstrated their full use in the navy homer or carrier pigeons are likely to be abandoned as a means of communicating between ship and shore.

Secretary Long has appointed a naval board, headed by Captain Chadwick, to determine whether or not the homer pigeon service should be given up. This action is taken in view of the successful application to naval purposes of the system of wireless telegraphy that has been made abroad.

Up to this time, for lack of funds, our navy

*From the "Electrical Review," London.

has done little to adopt this system, but with the money available under the new appropriation bill, it is expected that it will be brought up to date in this respect.

WHY SOME MEN SUCCEED.*

The man who expects to rise in this world must firmly make up his mind at the very start that, come what may, he will succeed. He must develop a firm conviction that it is possible to him, that he was made for it, that it is his birthright, a right of which he cannot be deprived by any combination of adverse circumstances. He should ever remember that success is as much his due as the acorn has the right to become the gigantic oak, or the small spring the mighty river.

Perhaps the first requisite is to develop an ideal in life, and constantly urge himself on to attain it. Be that ideal whatever it may, have a care that it is an honorable, a noble one. Aspire to something above the common level, and work up to it. Study yourself and find wherein your talents lie, and make that the foundation of your career. It is not for you to ask whether you can make a Webster, a Lincoln, a Grant, a Gladstone, or a Bismarck, but make the very best kind of a man of yourself that you know how, and never fail to try to find out the possibilities within yourself. You will win enough of the honors of this world and of your own conscience when you finally succeed in this undertaking.

Many, simply because they think they cannot make something great of themselves, simply make nothing at all. It is as much your duty to develop your one talent, if you should happen to possess only one, as it is to develop ten; and if you develop that one conscientiously and thoroughly, you will be just as great a success as the one who develops ten. Make your motto: "What man has done, man can do," and fight it out on that line with all of the grit, vigor and determination possible to you.

The most unquestionable badge and ensign of a sovereign mind is that tenacity of purpose which, through all changes of companions, fortunes or surroundings, changes never, bates no jot of heart or hope, but wearies out of all opposition, until it safely arrives at its port or goal. Then comes the serenity resultant from having safely weathered a tempestuous storm on the seas of life, and having at last safely reached a friendly harbor.

Phillips Brooks tells us that "No true man can live half a life when he has genuinely learned that it is half a life. The other half, the higher half, must ever haunt him." In doing our duty to ourselves in this matter, we must necessarily do it to those whose interests are linked in ours.

Progress may seem slow at the start, in fact, it may be imperceptible to us, but Emerson truly says that "What a man is engraves itself on his face, on his form, on his fortunes, in letters of light, which all may read but himself."

John Wanamaker, in summing up a lecture to young men on this subject some months since, advised them to remember at all times this one sentence: "Do your best, that is the road to success."

He happens to be one of those men, who by his own efforts and will power, raised himself from the very bottom of the ladder to its top-most rung of honor and success, and as a conse-

quence his advice should contain some elements of practicability.

Develop yourself, your strength. The habit of depending on self, the determination to find one's resources within one's self, and not without, will develop strength. Crutches were made for cripples, not for able-bodied men with sound minds; and whoever attempts to go through life on mental crutches will not go very far, and will never be very successful.

"Life without industry is guilty, and industry without intellect is brutality."—Ruskin.

Failure, like disease, is abnormal. Nothing is more depressing than holding for years the thought of defeat, or that you are unlucky and are not intended for success as others are. The very thought is debilitating. Fear of failure, or lack of confidence in one's ability, is one of the most potent causes of failure. Convince yourself of your ultimate success; cultivate hope, and the thought that true merit seldom goes unrewarded. Remember that "True hope is based on energy of character. A strong mind always hopes, knowing, as it does, how slight a circumstance may change the course of events."—Von Koeber.

That success is a normal condition is shown by the fact that it is a great health tonic. People who have been in delicate health for years, upon suddenly or unexpectedly achieving some signal success, immediately improve in health. The mind acts upon the body, and there is a rebound from the old depressed condition to the vital, the normal, the healthy. Holding a success thought brightens your outlook, your view, all seems better, and it scatters your specters of doubt and fear, and sends an electric current of hope and power through you that will revolutionize your possibilities and transform you into a new being.

EXPERTS STUDYING THE VARIOUS ELECTRIC TUNNEL SYSTEMS.

In the progress of the work on the New York Underground Rapid Transit road, which is going ahead at a rate unprecedented in the history of public works in this city, the New York "Sun" says that the preparation for the future electric equipment is not neglected, although laymen looking on at the work are sometimes inclined to think that it is forgotten or unjustifiably ignored. On every section of the road that is building the contractors are putting in sixteen or more ducts or conduits for cables. These are being provided not only for the immediate future of the road but for the more remote requirements.

But this is only the groundwork, as it were, of the electric equipment for the underground road. With the ducts provided for the cables which are to carry the electric power the question of how the power is to be applied to the train motors is one that may be considered and answered at whatever time becomes convenient.

John B. McDonald has about three years yet in which to complete his contract for the construction of the road, although he said that he could complete his contract in a year less than the legal limit, and competent authority in the Rapid Transit Commission declares that at the rate of progress at present Mr. McDonald can do this. This means that the construction work will be completed in about two years. Even so, there is abundant time ahead for contracts for the electrical equipment of

the road, according to the electric men of the city, and it is said that the reason no other sign than the ducts along the subway is to be seen at the present time is that the contractors are waiting to take advantage of the latest devices in electric engineering.

It is a common idea, which electricians generally concede to be accurate, that the advances in electric science follow so closely upon one another that almost from day to day some step of progress is recorded. In the circumstances delay in the closing of contracts for the equipment of the underground road might be expected to inure to the benefit of the contractor and of the public.

It is said that no radical or systematic advance has been made in the way of the electric motor since its inception as a practical factor in commercial traction a decade ago, but small mechanical improvements have been made, and above all there have been advances with each great successful installation of an electric power plant in various parts of the country in the past few years of which the New York underground road will reap the advantage.

The road will at any rate have the advantage of the experience gathered at Boston and Chicago and Niagara Falls, and, it may be, of that founded upon the installation of the "two-penny tube" in London. For not less than eight months the projectors of the road under the contract let by the Rapid Transit Commission have been considering a plan, or rather many plans, for the electrical equipment of the road, and a few months ago the Rapid Transit Subway Construction Company selected as its electric director L. B. Stillwell, whose most recent achievement has been the construction of the power house and plant of the Manhattan Railway Company at Seventy-fourth street and the East River.

The plant of the Manhattan Railway Company is the largest up to the present time erected anywhere in the world. Mr. Stillwell had had experience before his connection with this enterprise with electric work in Boston and at Niagara Falls, where he was the electrical director of the Niagara Falls Power Company.

The construction company has not stopped here, but has brought on another electrical expert from Buffalo, Mr. Stott, who has had experience in the electric light, heating and traction business of Buffalo and its vicinity. It is said that the problem of electric traction in the New York subway is to be solved practically on the experience derived in the operation of the Chicago elevated railroad and the Buffalo and Lockport road.

There are Philistines, however, who say that it may be that the experience of London will make a difference with New York before all is said, in that the Ganz Company of Budapest has offered to equip the London road with its alternating current system for \$100,000 less than the terms fixed by the electric equipment agencies which utilize the direct current. No large plant in this country designed for traction purposes, is based upon the system proposed by the Ganz people, it is said, although one of the great electric companies of this country is known to favor that method when possible.

Mr. McDonald's people are reticent as to their purposes regarding the electric equipment of the underground road as yet, but it is understood that they have had representatives

*From the "Mechanic."

abroad, as well as looking into the possibilities of electric traction here.

According to the information obtainable it has not yet been determined even whether the New York road is to have third rail or overhead trolley power supply. It is expected, however, that the third rail system will be adopted ultimately. The overhead trolley system is open to the objection that the method of applying it would have to be different in the tunnel and when the road runs on a viaduct, it is said by the engineers. The third rail system, besides being very practical, has the advantage of very low maintenance cost.

It is worth while here to tell an incident of the late Charles P. Clark's railroad life. According to men who should be well informed on the premises, to Mr. Clark is due the idea of the third rail as a means of supply of the electric current for railroad traction purposes. A friend of Mr. Clark's said recently:

"The first practical use of the third rail was on the Nantasket Beach branch of the Consolidated road, and later on the new Berlin and Hartford branch. Mr. Clark told the men who had the experiments there in charge that what he wanted was a system which would permit the use of the articles common in the operation of a steam railroad. He did not, he said, want a system which would necessitate the employment of a whole new staff of electrical experts who must have also a machine shop of their own and what not. He desired that those things be utilized which could be readily replaced by the railroad shops and mechanics, and for this reason largely the third rail as a feeder of the electric current came into use."

The location of the electric plant for the Rapid Transit road has not been made known to the public yet, if, indeed, the managers of the company have decided upon one. It is said that although a single great plant is most likely to be the plan fixed upon, it is possible that the builders of the road may determine to operate from several different central stations, perhaps three.

Should the present company build the tunnel to Brooklyn, it is said to be quite likely that one of the central power stations would be on that side of the East River. It is held to be generally desirable to have the central plant, if there be only one, as near as possible to the theoretical load center, which in the case of the Manhattan elevated roads is figured at or near Fifth avenue and Fifty-third street, and presumably it would not be far from that point in the case of the Rapid Transit road. The Manhattan roads, of course, could not locate the big power house from which they are to be operated by electricity at that central point and so a site was selected at Seventy-fourth street and the East River, which is said to be a very satisfactory location.

That the company which is building the tunnel road under Mr. McDonald's direction has plenty of time yet to consider and plan in the matter of providing an electric plant to run the road may be realized when it is told that men familiar with electric equipment operations say that large as the demands of the Rapid Transit road will be in the way of electrical machinery, a full equipment can be completed without undue haste in a year or fourteen months. The public idea is that the Manhattan and Metropolitan companies have been so long a time in putting up their plants that such a work must necessarily be of a slow character. Neither of these companies, however, has had any need to hasten the work on the electrical plants.

INCORPORATIONS.

The Sullivan Electric Company, Sullivan, Ill. Incorporators: J. H. Baker, W. A. Steele and A. J. Patterson.

The Fox River Gas & Electric Company, Oshkosh, Wis. Capital stock, \$350,000. The stock is held by Oshkosh men.

The Brice Gas & Electric Company, Mason City, Ia. Capital stock, \$300,000. Incorporators: W. E. Brice and C. H. McNider.

The Camp Floyd Electric Company, Provo, Utah. Capital stock, \$20,000. Incorporators: A. L. Woodhouse, J. R. Hauch, W. S. Jennens and S. C. Lockner.

The Cloquet Electric Company, Cloquet, Minn. Capital stock, \$50,000. Stockholders: James Richardson of Duluth, H. C. Homly and J. E. Lyons of Cloquet.

The California Central Gas & Electric Company, Sacramento, Cal. Capital stock, \$1,500,000. Incorporators: J. Martin, J. A. Britton, E. H. Pierson and H. U. Roeding.

The Stone City Light, Heat & Power Company, Bedford, Ind. Capital stock, \$100,000. Directors: Thomas F. Barrett, Edward McSweeney, James E. Bruff, James E. Pitts and Thomas O'Doggy.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED APRIL 2, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

670,948. Brake for Vehicles. Adolph G. Carlson, Chicago, Ill. Filed May 19, 1899.

671,032. Controlling Apparatus for Signal-Operating Systems for Railways. Benton C. Rowell, Chicago, Ill., assignor to the Rowell Potter Safety Stop Company, Portland, Me. Filed Feb. 13, 1899.

671,179. Trolley-Car. Louis A. Brod, Brooklyn, N. Y. Filed Aug. 15, 1900.

671,404. Electric Block Signal System for Railways. Harry Shoemaker, Philadelphia, Pa., assignor of one-half to Gustave P. Gehring, same place. Filed Nov. 26, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

670,927. Incandescent Electric Lamp. Charles R. Campbell, Huguenot, N. Y., assignor to himself and Howard H. Bush, New York City. Filed July 12, 1900.

670,949. Adjuster for Incandescent Electric Lamps. Lewis A. Carpenter, Revere, Mass., assignor to Frank W. Morse, Boston, Mass. Filed Sept. 12, 1900.

670,988. Automatic Protecting and Detecting Device for Electric Light Circuits. Harry Etheridge, McKeesport, Pa. Filed June 19, 1899.

670,994. Electric-Lighting System. Joseph A. Mesiroff, Milwaukee, Wis. Filed April 30, 1900.

671,195. Shade Holder for Electric Lights. Edwin O. Pease, Bangor, Me. Filed Nov. 21, 1900.

671,338. Conductor and Contact for Electrical Glow-Lamps. Julian A. Halford, Bayswater, Eng., assignor to the Electric Lighting Boards, Limited, Pall Mall, London County, Eng. Filed Sept. 10, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

670,952. Potential-Regulator. Augustine R. Everest, Lynn, Mass., assignor to the General Electric Company of New York. Filed Sept. 24, 1897.

671,079. Contact-Finger for Electric-Motor Controllers. Frank W. Garrett, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed July 24, 1900.

671,084. Electric Welding Apparatus. Henry F. A. Kleinschmidt, Johnstown, Pa., and Frederick A. Phelps, Jr., Newark, N. J., assignors to the Lorain Steel Company of Pennsylvania. Filed April 24, 1900.

671,249. Rectifier. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company of New York. Filed Jan. 9, 1900.

671,265. Electric Recording Instrument. Frank P. Cox, Lynn, Mass., assignor to the General Electric Company of New York. Filed July 9, 1900.

671,278. Electrically Controlled Switch. Edward M. Hewlett, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Dec. 30, 1898.

671,279. Measuring Instrument. Charles S. Jameson, Swampscott, Mass., assignor to the General Electric Company of New York. Filed Dec. 23, 1898.

671,282-671,283. Electric Meter. Elton J. King, Fort Wayne, Ind., assignor to the General Electric Company of New York. Filed Jan. 20, 1900, Jan. 31, 1901.

671,289. Controlling Rotary Converters. Samuel W. Manger, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Jan. 16, 1901.

671,349. Electric Signaling Apparatus. William H. McClure and Dennis E. Healy, Worcester, Mass., assignors to the Gamewell Fire Alarm Telegraph Company, New York City. Filed Dec. 8, 1899.

TELEPHONES AND TELEPHONE APPARATUS.

671,311. Telephone Call-Box. Ward Decker, Owego, N. Y. Filed April 20, 1899.

MISCELLANEOUS.

670,931. Thermostat. Charles B. Garrett and William S. W. Blake, Minneapolis, Minn., assignors of one-third to Martin Dyke, same place. Filed Feb. 6, 1900.

670,913. Electric Fire-Engine and Hose-Carriage. Wilbur M. Whitlock and Edgar P. Harrison, Newark, N. J. Filed April 21, 1899.

670,946. Electric Igniter for Gas-Engines. Jacob L. Ash, Lansing, Mich. Filed Nov. 4, 1899.

670,964. Telegraphy. Donald Murray, New York City, assignor to the Postal Telegraph Cable Company, same place. Filed Jan. 17, 1901.

670,980. Telegraphic Instrument. Ambrose S. Bissell, New York City. Filed Sept. 4, 1900.

671,046. Telegraph-Recorder. George L. Foote, Brooklyn, N. Y., assignor to himself, H. G. Pierson and Charles Freemann, copartners under the firm name of Foote, Pierson & Co., of New York. Filed Jan. 29, 1899.

671,106. Automatic Stop for Electric Elevators. Allan Cowperthwaite, Brooklyn, N. Y., assignor to Alonzo B. See and Walter L. Tyler, same place. Filed Feb. 4, 1901.

671,139. Electric Heater. Alexander R. Leask, London, Eng., assignor of one-half to Percy Morgan Bellis, same place. Filed Dec. 13, 1900.

671,258. Attachment for Controller-Handles. Albert H. Armstrong, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Jan. 22, 1901.

671,259. System of Motor Control. Charles E. Barry, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Jan. 29, 1900.

671,271. Electric Fuse. William L. R. Emmet, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Jan. 27, 1900.

671,272. Electric Metering System. Walter C. Fish, Lynn, Mass., assignor to the General Electric Company of New York. Filed Jan. 18, 1899.

671,273. Metering Electric Energy. Walter C. Fish, Lynn, Mass., assignor to the General Electric Company of New York. Original application filed Jan. 18, 1899. Divided and this application filed Jan. 26, 1901.

671,334. Construction of Morse's Registering Telegraphic Instruments. Eugene Ducretet, Paris, France. Filed July 29, 1898.

671,350. Alarm System. James H. McCracken, Washington, Ind. Filed Nov. 23, 1900.

671,388. Device for Protecting Safes Against Burglars. Anthony P. Prichard, Tacoma, Wash. Filed Feb. 6, 1900.

671,403. Wireless-Telegraph System. Harry Shoemaker, Philadelphia, Pa., assignor of one-half to Marie V. Gehring, same place. Filed Nov. 26, 1900.

671,405. Telegraph. Harry Shoemaker, Philadelphia, Pa., assignor of one-half to Gustave P. Gehring, same place. Filed Jan. 12, 1901.

671,406-671,407. Wireless Telegraphy. Harry Shoemaker, Philadelphia, Pa., assignor of one-half to Marie V. Gehring, same place. Filed Jan. 17, 1901, Jan. 22, 1901.

671,420. Electrotherapeutic Spectacles. Alexander F. Humphrey, Allegheny, Pa. Filed Jan. 11, 1901.

COMMERCIAL PARAGRAPHS.

The Crocker-Wheeler Company, whose works are at Amper, N. J., report that the orders booked for the month of March exceed by a considerable percentage the largest manufacturing business the company has had at any time during its previous history. Among the more important contracts closed were the following: Philadelphia Engineering Works, 500 hp. in Crane motors. Witherbee, Sherman & Co., One Size 150 D, 150 kw. belted type generator, and 160 hp. in motors. General Electric Company (1900), Ltd., Glasgow, Scotland, One Size 150 D, 150 kw. belted type generator. Newport News Shipbuilding & Dry Dock Company, Two Size 15 D dynamotors; One Size 7½ Bipolar dynamotor; One Size 15 D dynamotor. The New United States Mint at Philadelphia, 19 motors aggregating 115 hp. Newton Street Railway Company, Newton, Mass., One Size 448 engine type, 400 kw. railway generator. The Guggenheim Smelting Works, Perth Amboy, N. J., Two Size 448 engine type, 520 kw. electrolytic generators. Alsen's American Portland Cement Company, West Camp, N. Y., Three Size 448 engine type, 400 kw. power generators, and One Size 168 engine type, 100 kw. lighting and power generator; also 43 motors aggregating 2,000 hp. Brandywine Traction Company, Brandywine, Pa., One Size 224 engine type, 200 kw. railway generator. John B. Stetson Company, Philadelphia, Pa., Two Size 336 engine type, 300 kw. lighting and power generators. Western Union Company, 36 machines for telegraphic work.

Attention is called to the advertisement on page iii of Mr. Oscar A. Michel, solicitor of American and foreign patents, 302 Broadway, New York City. Mr. Michel does not demand an advance fee for undertaking sales of patents for clients. He also offers to send a handsome nickel-plated match box, with much valuable information, to anyone desiring same.

THE TELEPHONE WORLD.

Telephone Company Trying to Reach New York.

Negotiations are on foot between Philadelphia capitalists operating telephone lines in Pennsylvania for the purchase of the Paterson, Passaic & Suburban Telephone Company of Passaic County. The parties control the local telephone companies in Trenton, Chester, Delaware, Easton, Allentown and Reading. They are desirous of getting into New York, and it is with the view of effecting this that they want to control the lines in Passaic County. An effort was made to get into New York by way of Newark and Jersey City, but the Bell Company succeeded in blocking them.

Messrs. Frank H. Knapp and C. R. Callaghan, of Bellevue, were in Cleveland, O., a short time ago, conferring with the officials of the United States Telephone Company, and have consummated a telephone deal of much magnitude. For several weeks past these gentlemen have been busy negotiating for the purchase and transfer of the Huron County Telephone Company, including their exchanges and good will. This company owns and operates exchanges at Monroeville, Chicago Junction and Plymouth, together with 10 miles of toll line. The Huron County Company will have a paid up capital of \$30,000. It will be reorganized, and Bellevue, Monroeville and Cleveland parties will be interested. This deal is one of the largest ever made in telephone property in Huron or Crawford Counties. The company will extend and enlarge its exchanges to greater capacity. It already has over 600 'phones in operation, and most excellent prospects for future growth. The capital stock has already been subscribed for except 50 shares, which sell for \$50 a share.

Nearly 300 telephone companies are doing business in Iowa, and this does not include a large number of private and farm lines which are in operation throughout the State. There are fully twice as many companies doing business in that State as last year when the assessment was made. The companies last year paid their taxes direct to the people, but this year they will pay to the various counties the same as the railroad companies.

A syndicate is being formed in O'Neill, Neb., to put in a telephone system for a local exchange and to connect with surrounding towns. For the first time in many years no interest is manifested in the city election. By common consent the city officers now in charge will hold over and the election will be but the formal ratification of the wishes of the people.

The United Telephone & Telegraph Company of Philadelphia has bought out and taken possession of the Independent Telephone Company and its plant in Lancaster. The price paid was \$120 a share and the total price \$210,000. The United Company recently acquired lines in a dozen other counties of Pennsylvania.

The Dirigo Telephone Company has obtained permission from the board of aldermen to do business in Portland, Me. For three years this company has been trying to get a foothold in that city, but its endeavor has heretofore been defeated by the New England Telephone Company.

W. D. Burford, local manager of the Cumberland Telephone & Telegraph Company at Owensboro, Ky., says that his company would spend about \$18,000 on the building recently purchased for an exchange, and on other improvements there this spring.

The Interstate Telephone Company recently held its annual meeting at La Crosse, Wis., and elected the following officers: President, James A. Tawney; vice president, John Dietze; secretary and treasurer, Otto Troost, Jr.

D. N. Tallman of Willmar has become the owner of the local telephone exchange in New Paynesville, Minn., the transfer from A. F. Knebel, who put in the exchange, having been completed.

The Central New York Telephone & Telegraph Company of Utica has increased its capital stock from \$8,000,000 to \$10,000,000. The company has a paid-in capital of \$800,000 and debts and liabilities of \$210,000.

A franchise has been granted the People's Telephone Company of Jackson and Detroit, Mich., which will give merchants needed direct communication with Detroit and Jackson.

The Union Telephone Company of Alma, Mich., has filed a notice of increase of capital stock from \$100,000 to \$150,000.

The People's Telephone Company of Newport, Tenn., is preparing to extend its line to Del Rio in that State.

Winnipeg Tires of the Bell Company.

The rates charged by the Bell Telephone Company for telephone service in Winnipeg, Man., viz., \$50 per year for business houses, and \$30 per year for private residences, are considered by the mayor to be exorbitant and he is taking action for the introduction of a cheaper system. While the mayor favors the establishment of a municipal system he has also entered into communication with the Home Telephone Company, which has systems at Buffalo, Niagara Falls and also in many of the New York State cities. The rates of this company are \$36 for business telephones and \$16 for those in private residences. Winnipeg has 1,487 telephones and the saving yearly at the reduced rates of the Home Company's system will be about \$30,000.

Eder H. Moulton, president of the Twin City Telephone Company of Minneapolis, Minn., the new corporation which grew out of the reorganization of the Mississippi Valley Company, has no fear that the railroads will not subscribe for the use of the company's 'phones in time. Mr. Moulton says that some of the roads are already using Twin City Company 'phones, and more will have them installed in the near future. As public servants the railroads must accommodate the people, no matter what influences might prompt them to favor one telephone company more than another. The independent company, Mr. Moulton says, will become dominant in the local field just as surely as the local newspaper must reign supreme in its own field. The complete domination of all small cities and towns by independent telephone companies sounds the death knell of great monopolistic companies such as have wrung extortionate rates from the public for the past twenty years. The days of such monopolies are over in the telephone business, owing largely to the expiration of the patents which controlled the situation for a long time.

The Peninsular Telephone Company of Tampa, Fla., has made application for a charter. The capital stock is placed at \$300,000, at \$100 a share. William G. Brorine, Jacob F. Brorine, Gay Huffman, James W. Barwick and James J. Lunsford are the incorporators, and compose the board of directors, which shall serve until the time for the regular election next December. This corporation will have the franchise for a telephone system which was granted to Brorine & Huffman by the council of Tampa. The company has placed the price of business telephones at \$2.75 a month, and residence 'phones at \$1.50, and several hundred subscribers have already been secured. The same company will erect systems in Lakeland, Bartow, Fort Meade, Plant City, Fort Myers, Arcadia and Palmetto at once, and they will all be connected.

Receiver James Murphy of the North Dakota Telephone & Electrical Company has decided to sell the telephone line at a private sale. The line is located in Foster and Wells Counties and connects Harvey, Fessenden, Carrington and other towns. Since the line has been in the hands of a receiver it has paid handsomely, so it is said. It is understood the Northwestern Telephone Company may buy. There will be other bidders, however.

The Jefferson & Warren Telephone Company directors met in Warren, O., a short time ago, and decided to extend its lines in the northern part of Trumbull County, and in Ashtabula County, reaching a number of places not yet supplied with telephone connections.

Mandeville, La., is soon to enjoy the benefits of a local and long distance telephone. The Bell Telephone Company has secured enough subscriptions for the local exchange, and, with the long distance already in operation, that town will soon be connected with the outside world by this modern convenience.

The Wilson & Tarboro Telephone Company has applied to the Secretary of State of North Carolina for an amendment to its charter, increasing its capital stock from \$10,000 to \$25,000. W. P. Mercer is president and J. C. Hales secretary.

I. W. Ramsey, a telephone promoter, was in Appling, Ga., recently, in the interest of the telephone, and it is said that there will soon be a line put up from Grovetown to Appling. This will be of great value to the latter place.

The Eastern Telephone & Telegraph Company has been granted a franchise to string wires and operate in Woodbury, Pa.

The new switchboard for the Athens, Tenn., exchange of the Cumberland Telephone Company is of the latest style, and has a capacity of 1,600 drops.

It seems that the long distance telephone is making some progress towards reaching Hot Springs, Va. The American Long Distance Telephone Company has secured permission to run its wires through Covington, and it is understood that it will reach Hot Springs. The fact that the Clifton Forge Telephone Company, which had an exclusive franchise in Covington, waived its rights to object to the concession, indicates that the Virginia Long Distance Phone Company is operating with the American Company. A long-distance 'phone, giving connection with the Eastern cities, will probably get a good deal of business from Hot Springs.

Col. J. H. Allen, of St. Louis, has been granted permission by the Bond County, Ill., supervisors to construct a telephone line in that county. He intends to connect by telephone the towns of Greenville, Smithboro, Woburn, Mulberry Grove, Pleasant Mound, Hookdale, Tamalco, Keysport, Beaver Creek, Dudleyville and other towns.

An amendment to the charter of the Memphis, Tenn., Telephone Company, was lately filed, increasing the capital stock from \$200,000 to \$400,000, and also providing for the manufacture of electric light and motive power material and the equipment of plants for such purposes.

The Mutual States Telephone Company of Cleveland, O., has constructed a model toll line through Leslie, Mich., and is furnishing excellent service. The exchange also connects with the McLaughlin & Ward Telephone Company of Jackson, and all other independent companies of Michigan.

It is stated that work will shortly be commenced on the Bedias extension of the telephone line from Navasota to Anderson, Tex., and it will be pushed to completion as quickly as possible.

The McMinnville, Tenn., Telephone Company sold the McMinnville Exchange plant and adjoining toll lines to the Cumberland Telephone Company a short time ago.

The Fayette Telephone Company of Lexington is making arrangements to construct a line to Waddy by way of Lawrenceburg, Ky.

A village telephone company has been organized at West Burke, Vt., with Henry Moulton as president, Perry Paster secretary and agent, and David Smith, treasurer.

An effort is on foot to organize a telephone company in Dover, Tenn. Subscriptions are being rapidly taken and it is thought the line will shortly be in operation.

TELEPHONE INCORPORATIONS.

The Maysville Telephone Company, Maysville, Ky. Capital stock, \$5,000.

The Grayson County Telephone Company, Sherman, Tex. Capital stock, \$150,000.

The Jackson County Home Telephone Company, Jackson, O. Capital stock, \$50,000.

The Hazelrigg Co-operative Telephone Company, Hazelrigg, Ind. Capital stock, \$500. The directorate is to consist of nine members.

The Sidney Home Telephone Company, Sidney, Ill. Capital stock, \$2,500. Incorporators: C. C. McElwee, H. M. Bentley and C. H. Plymire.

The Independent Telephone Company, Seattle, Wash. Capital stock, \$600,000. Incorporators: Sherwood Gillespie, E. W. Andrews and Edward S. Byrnes.

The Citizens' Mutual Telephone Company, Cambridge, Ill. Capital stock, \$2,500. Incorporators: William M. Smith, Clyde B. Taylor and John W. Nelson.

The Advance Electric & Telephone Company, Chicago, Ill. Capital stock, \$15,000. Incorporators: V. Horace Messenger, H. Henry Hansen and George A. Thompson.

The Taylorsville Telephone Company, Taylorsville, Ind. Capital stock, \$2,000. Directors: Seneca S. Drybread, Benjamin W. Chambers, Edward McSweeney and B. E. Everne.

The Liberty Independent Telephone Company, Liberty, Neb. Capital stock, \$5,000. Officers: President, George Sutter; vice president, C. D. Matthews; secretary, R. T. Moore; treasurer, G. L. Meissner.

The Bell County Telephone Company, Temple, Tex. Capital stock, \$120,000. Incorporators: James King Duffy, New York City; James S. Brailer, Wauseon, O.; Z. B. Campbell, San Antonio; C. N. Haskell, Ottawa, O.; J. B. Earle, J. E. Boynton, Waco; H. M. Dougherty, Columbus, O.

GENERAL ELECTRICAL NEWS.

Lighting.

Aberdeen, Wash.—The electric light company of this city contemplates putting in additional equipment, which will double its present capacity and involve an expenditure of about \$10,000.

Avon, Ill.—The Turner-Hudnot Company of Pekin, Ill., contemplates the erection of an electric light plant here.

Chattanooga, Tenn.—The plans and specifications for the county's electric lighting plant were completed recently by F. P. Sweet, the electrician, and have been turned over to the committee.

Columbus, O.—An ordinance was lately passed granting the Indianola Land & Power Company an electric light franchise.

Corning, Ia.—The electric light plant destroyed by fire recently with \$7,000 loss is to be rebuilt.

Covington, Ky.—The light committee of the council will recommend the erection of a city electric light plant.

Delta, Col.—The present board of trustees has passed an ordinance submitting the matter of issuing bonds for a municipal electric light plant to the vote of the taxpayers at the coming election.

Fordyce, Ark.—This town contemplates establishing an electric light plant. Address C. McKee.

Gloversville, N. Y.—John Begley, formerly of Cooperstown, is at the head of a newly organized electric light and power company here. The company's capitalization is \$40,000.

Hogansville, Ga.—The people here will soon vote to issue bonds for an electric light plant.

Howell, Mich.—The citizens have voted to bond the town for \$15,000 for a municipal electric light plant.

Knoxville, Tenn.—The Knoxville Electric Light & Power Company will install additional machines to be used for incandescent purposes.

Mackinac Island, Mich.—F. C. Andrews is interested in the Municipal Lighting & Water Company organized with \$100,000 capital stock to operate an electric light plant in this city.

Marion, Ind.—M. C. Mead & Co., operating one of the electric light plants of the city, will in the near future extend its service to South Marion.

Melbourne, Ia.—An electric light plant is being talked of here.

Millersburg, O.—The electric light plant at this place is to be enlarged and improved.

Nashua, Ia.—The citizens are agitating the electric light question.

Saybrook, Ill.—The citizens of this place are agitating the question of erecting an electric light plant.

Sheffield, Ala.—H. Habler has applied for a franchise for the construction of a \$75,000 electric light plant and waterworks.

Shepherdstown, W. Va.—The citizens of this place are taking active steps toward the establishment of an electric light plant.

Smithfield, Va.—Messrs. Chalmers and Gay expect to have an electric light plant in operation before the close of summer.

Snobomish, Wash.—The Snobomish electric light plant has been bought by E. S. Aldrich and O. Lewis, of Livingston, Mont. The plant is to be enlarged.

Sutton, Neb.—The people here are talking of erecting an electric light plant.

Tulsa, I. T.—The Crystal Ice Company of this place wants prices on an electric light outfit with everything complete for installing.

Watervleit, N. Y.—An electric light plant is to be erected here.

Wimshoro, S. C.—The citizens of this place are talking of electric lights.

Street Railways.

Augusta, Me.—A movement has been started to construct an electric street railway from this city to Togus. The enterprise as now talked up is to be financed and carried through by the Augusta, Hallowell & Gardiner Electric Railroad Company.

Batavia, N. Y.—A new electric road to be known as the Batavia, Albion & Lake Ontario Railway has been organized, with \$350,000 capital stock, by G. W. Aldridge and J. H. Gregory.

Buffalo, N. Y.—The Buffalo, East Otto & Cattaraugus Railway Company has been organized to build and operate a trolley line between this city and Cattaraugus.

Burgin, Ky.—Eastern capitalists have had representatives here looking over the ground and seeing what kind of terms they can effect with the proper parties in regard to the building of interurban electric lines.

Chicago.—A syndicate of Cleveland men, aided by a New York banking house and two Philadelphia institutions, has agreed to finance the Aurora, Wheaton & Chicago Railway, a trolley line 40 miles in length, from this city to Aurora. The road will be capitalized at \$3,000,000.

Cincinnati, O.—The Cincinnati, Lebanon & Dayton Traction Company has been incorporated with \$10,000 capital stock and the line will extend through Hamilton, Warren, Butler and Montgomery Counties.

Ellenville, N. Y.—The Ellenville & Kingston Railroad Company was lately incorporated with a capital of \$300,000, to operate a standard gauge road by steam or electrical power, 28 miles long, to connect with the Ellenville branch of the New York, Ontario & Western Railway Company, near this place, and run to the city of Kingston. The directors are Thomas H. Fowler, John B. Kerr, O. D. Ashley, C. Ladyard Blair, F. K. Culbert, C. L. Hoyt, A. S. Roe, Grant B. Schley and Thomas B. Childs of New York.

Elyria, O.—Elyria capitalists have organized a stock company and will build an electric car line between Janesville, Wis., and Rockford, Ill., passing through Beloit. The line will be 32 miles long.

Farmington, Mo.—The proposed electric railway from De Lassus to this place and Flat River will be built by a home company. P. Giessing is president and W. R. Lang, treasurer. The road will be 15 miles long and cost \$125,000.

Hoboken, N. J.—The directors of the Bergen Turnpike Company met at Jersey City last week and voted to accept the franchise offered by the towns of West Hoboken and Union Hill and the townships of North Bergen, Fairview and Ridgefield Park for the establishment of a new trolley road from this city to Hackensack, and also to borrow \$1,000,000 from the New Jersey Title Guarantee & Trust Company of Jersey City, for which a mortgage will be issued. The money will be used in building the road, and will be advanced by the trust company as needed.

Marysville, O.—R. W. Thompson of Peoria is interested in a new proposed electric road which is to connect Lima with Columbus via Westminster, West Newton, Roundhead, Lewistown, etc. This line is to intersect with the Union Electric line from Marysville on to Columbus.

Palmyra, N. Y.—Articles of incorporation for the Palmyra Electric Railway Company have been filed. The company purposes constructing and operating a street railway four and a half miles long through this village, with \$45,000 capital.

Port Chester, N. Y.—The New York & Port Chester Railroad Company, capitalized at \$250,000, was incorporated April 3 to operate an electric street surface road 25 miles long from the Harlem River at Port Morris through the Borough of the Bronx to Mount Vernon, Pelham Manor, New Rochelle, Larchmont, Orienta, Mamaroneck, Milton, Rye and this place to the Connecticut line, with a branch to Clason's Point, on the East River. The directors are: Charles Heinicke of Whitestone, M. F. Germond of Dumont, N. J.; W. H. Heath of Brooklyn, M. W. Baldwin, E. E. Mailloux, Mesmore Kendall, Christopher Kaiser, C. O. Mailloux of New York City, and Ernest Muller of Westfield, N. J.

Syracuse, N. Y.—Recent dispatches from this city gave credence to a rumor that capitalists are back of a gigantic enterprise having as its object the connection of Syracuse and Rochester by a trolley line.

Manufacturing.

Chicago.—The Dr. Alexander Medicine Company of this city has changed its name to the Electro-Chemical Storage Battery Company, and also its object to the manufacturing of electrical appliances.

New Castle, Pa.—The Keystone Foundry property has been purchased by a company which will soon begin the manufacture of brass electrical supplies and a patent electric burglar alarm matting. The stockholders are C. H. Johnson, Charles Matthews, John B. Brown, C. J. Kirk, W. S. Johnson, G. W. Hartman, E. S. Whiting, T. H. Hartman and Robert K. Aiken.

New York City.—The National Battery Company, capitalized at \$500,000, will manufacture electric batteries. W. B. Greeley, C. A. Wendell and R. S. Nichols hold an interest in the concern.

Trenton, N. J.—The Lorain Steel Motor Company, with a capital of \$600,000, was lately incorporated here to manufacture and deal in electrical machinery of all kinds. Alfred George Brown, Emery W. U-mair and Edwin F. Maguffin, all of East Orange, N. J., are those interested.

West Chester, Pa.—The indications of the Sun Electric Supply Company, a manufacturing concern, locating here are considered favorable.

Company Matters.

Albany, N. Y.—At the recent annual meeting of the Albany & Hudson Railway & Power Company, which operates the new third-rail electric road between this city and Hudson, the following were elected directors: Clinton L. Rossiter, Gov. Foster M. Voorhees of New Jersey, Henry Seibert, W. F. Sheehan, R. A. Smith, Seth L. Keeney of Brooklyn, A. M. Young of Bradford, Conn., James Purcell of Hudson, and H. G. Runkle of Plainfield, N. J.

Boston, Mass.—Judge Bond of the Superior Court has appointed James E. Leach receiver of the Anchor Electric Company.

Steubenville, O.—The Steubenville Traction & Light Company has increased its capital stock from \$500,000 to \$700,000.

Power and Transmission.

Baltimore, Md.—Representatives of the United Railways & Electric Company and of the Susquehanna Electric Power Company have conferred relative to the proposed transmission of the electric power to this city for use by the railway company. The Continental Trust Company is to finance the scheme if it be accepted.

Binghamton, N. Y.—A large project is on foot to harness the power of the Susquehanna River, and to utilize the energy which is now wasted in providing power for manufactories and plants in this city, Lester Shire and the neighboring country. The project has progressed sufficiently so that now the fulfillment of the plan is assured.

Mines.

Colorado Springs, Col.—George Andrews is installing two electric hoists on the Xenia claim on Tenderfoot hill.—The Colorado Electric Power Company has closed a contract with the Occidental Development Company to install a 5 horse power hoist on the X-10-U-8 claim on Squaw Mountain. The same company will install for F. J. Clark a 15 horse power hoist on the Dexter claim.

Automobiles.

Kenton, O.—G. J. Miller has received letters from his attorneys saying that his applications for patents upon methods of making electrodes for storage and other batteries for automobiles, and for apparatus for making electrodes, have been granted.

Warren, O.—It is reported that the Ohio Automobile Company has booked one order for \$40,000 worth of automobiles. The capacity of the plant is being increased.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

R.A.N.E.						R.A.N.E.							
NAME	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.	NAME	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.		
Albany, N. Y. —Apr 8						Hartford Conn. —Apr 8							
United Traction Co. (Consolidation of the Albany and Troy City Railway.)	100	\$5,000,000	\$5,000,000	1 1/2 % Q.	108 1/2	109	Hartford Street Ry. Co.	100	\$4,000,000	\$200,000	8 % S., Oct.	100	—
						Hartford & West Hartford RR							
						100							
Allentown Pa. —Apr 8						Holyoke Mass. —Apr 8							
Allentown & Lehigh Val. Trac Co	100	4,000,000	1,800,000	—	—	15	Holyoke Street Ry. Co.	100	400,000	400,000	4 % A., June	207 1/2	212
						Hoboken N. J. —Apr 8							
Bridgeport, Conn. Apr 8	100	2,000,000	2,000,000	1 % Aug.	100	—	North Hudson Co. (N. J.) Ry. Co.	25	1,250,000	1,000,000	8 %	100	—
Bridgeport Traction Co	100	2,000,000	2,000,000	1 % Aug.	100	—	Indianapolis, Ind. —Apr 8						
Baltimore Md.—Apr 8	50	24,000,000	12,000,000	—	17 1/2	17 1/2	Indianapolis Street Ry.	100	5,000,000	5,000,000	—	25	25 1/2
a United Rail ways & Elec. Co. com.	50	24,000,000	12,000,000	—	17 1/2	17 1/2	Lancaster, Pa. —Apr 8						
						Lancaster Traction Co.							
Boston, Mass.—Apr 8	25	5,000,000	1,081,925	1 % Q., Jan. 15	—	—	Lancaster & Col. Electric Ry.	100	10,000,000	9,900,000	—	—	—
New England Street Ry.	100	4,000,000	4,000,000	6 % S., A. & O.	15	16	West End Street Railway	100	—	87,500	—	—	—
North Shore Traction Co. com.	100	2,000,000	2,000,000	8 % S., Oct., '99	85	87	Louisville, Ky. —Apr 8						
North Shore Traction Co. pfd.	50	10,000,000	4,000,000	4 % S., Jan.	118	111 1/2	Louisville Ry.	100	4,000,000	8,500,000	1 1/2 % April.	82	83
West End Street Ry. Co. 8 % pfd.	50	4,000,000	6,400,000	2 1/2 % Aug. '99	174 1/2	175	Louisville Ry.	100	2,500,000	2,500,000	2 1/2 % S., Oct. 1	112	113
Boston Elevated R. R.	100	10,000,000	—	—	—	—	Minneapolis, Minn. —Apr 8						
						Twin City Rapid Transit Co.							
						Twin City Rapid Transit Co. 7 % pfd.							
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* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Mts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h \$30 per share on outstanding capital paid as rental by leasee—West Chicago St. RR. Co.; \$250.00 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 35 % per annum paid on outstanding capital as rental by leasee—North Chicago Street Railroad Company; \$625,000 of stock owned by West Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 5 % on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, leasee.

l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Croton Railroad at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Poyonia Ferry—now Metropolitan Street Railway.

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1893, at \$215,000 per annum.

i Leased to Metropolitan Street Railway for 18 % on stock.

j Leased to Met. St. Ry. for 99 years from April 24, 1892; 6 % first 5 years, 8 % thereafter.

k Leased to Metropolitan Street Railway for \$145,000 per annum.

l Leased to Metropolitan Street Railway for 18 % on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1 1/2 % yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.

p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6 % on \$3,000,000 capital stock.

r Leased to Consolidated Traction Company for 4 % on capital stock.

s Leased to Consolidated Traction Company for 7 % on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par.	Authorized.	Issued.	Rate and Date of Last Div.	Div.	Asked.	NAME.	Par.	Authorized.	Issued.	Rate and Date of Last Div.	Div.	Asked.
New Bedford Mass. —Apr 8 Union Street Railway Co.....	100	\$800,000	\$800,000	1%, Feb.	100	165	Boston, Mass. —Apr 8 American Tel. & Tel. Co.....	100	\$5,000,000	\$5,000,000	4% Q. Jan.	100	150
Northampton, Mass. —Apr 8 Northampton St. Ry.....	100	800,000	225,000	4% A., June.	170	175	Erle Telephone & Telegraph Co.....	100	10,000,000	10,000,000	1% Q., Feb. 20.	100	150
Omaha, Neb. —Apr 8 Omaha Street Ry.....	100	5,000,000	5,000,000	8% A. and N.	65	65	New England Telephone Co.....	100	10,000,000	10,000,000	\$1.50 p. sh. Feb.	100	150
Fairfield, N. J. —Apr 8 Fairfield Ry. Co.....	100	1,200,000	1,200,000	—	64	—	New York. —Apr 8 American Telephone & Cable Co.....	100	14,000,000	14,000,000	1% Q. Jan.	100	150
Providence, R. I. —Apr 8 United Traction & Electric Co.....	100	3,000,000	3,000,000	1% Q., Oct. '98	110	111	*Central & South Am. Tel. Co.....	100	6,500,000	6,500,000	1% Q. Jan.	100	150
Philadelphia. —Apr 8 Fairmount Park Trans. Co.....	50	2,000,000	1,770,000	2% Q., Jan. '99	28	24	*Commercial Cable Co.....	100	10,000,000	10,000,000	1% Q. Jan.	100	150
Hestonville, Man. & Fairmount.....	50	1,900,000	1,900,000	2% Q., July 15, '99	47	48	Franklin Tel. Co.....	100	1,000,000	1,000,000	1% Q. Jan.	100	150
Hestonville, Man. & Fairmount.....	50	500,000	500,000	2% Q., July 15, '99	75	76	Erle Telephone & Telegraph Co.....	100	5,000,000	4,200,000	1% Q., Feb.	100	150
aFairmount Pk. & Had. Pass. Ry.....	50	800,000	800,000	8% Feb. 1, '99	75	76	*Gold & Stock Tel. Co. guar. 6%.....	100	5,000,000	5,000,000	1% Q. Jan.	100	150
Union Traction Co.....	50	800,000	29,000,450	8% Feb. 1, '99	75	76	*International Ocean Tel. Co. guar. 6%.....	100	8,000,000	8,000,000	1% Q. Jan.	100	150
aElectric Traction Co.....	50	500,000	500,000	—	75	76	Mexican Telephone Co.....	100	2,000,000	2,000,000	1% Q. Jan.	100	150
dOtisville Passenger Ry.....	50	1,000,000	1,000,000	—	75	76	*New York & New Jersey Tel. Co.....	100	5,000,000	5,000,000	2% Q. Jan.	100	150
aFrankford & Southwark Pass. Ry.....	50	1,000,000	1,000,000	—	75	76	*Pacific & Atlantic Tel. Co. guar. 4%.....	100	2,000,000	2,000,000	1% Q. Jan.	100	150
Lombard & South Street Ry.....	50	1,000,000	1,000,000	—	75	76	*Postal Telegraph Cable Co.....	100	15,000,000	15,000,000	1% Q. Jan.	100	150
Second & Third Streets Ry.....	50	1,000,000	1,000,000	—	75	76	*South'n & Atlantic Tel. Co. guar. 5%.....	100	2,000,000	2,000,000	1% Q. Jan.	100	150
People's Traction Co.....	50	1,500,000	1,500,000	—	75	76	*Commercial Union Telegraph Co.....	100	500,000	500,000	1% Q. Jan.	100	150
aGermantown Passenger Ry.....	50	800,000	800,000	—	75	76	Western Union Telegraph Co.....	100	97,000,000	97,000,000	1% Q. Jan. '99	100	150
aGreen & Oakes Passenger Ry.....	50	1,500,000	1,500,000	—	75	76	†Div. guar. by Postal Tel. Co.	100	—	—	—	100	150
aPeople's Passenger Ry.....	50	750,000	750,000	—	75	76	Miscellaneous. —Apr 8 American Dist. Tel. (Phila.).....	25	400,000	400,000	1% Q. Jan.	25	97
aPeople's Passenger Ry.....	50	750,000	750,000	—	75	76	Bell Telephone Co. (of Canada).....	100	2,500,000	2,500,000	2% Q. Jan.	100	150
aPhiladelphia Traction Co.....	50	800,000	800,000	—	75	76	Chesapeake & Potomac Tel. Co.....	100	—	—	—	100	150
aCatherine & Bainbridge St.....	50	1,000,000	1,000,000	—	75	76	Chicago Telephone Co.....	100	—	—	—	100	150
aContinental Pass. Ry.....	50	800,000	800,000	—	75	76	Central Dist. Tel. & Tel. Co. (Phila.).....	100	750,000	750,000	—	100	150
aEmpire Passenger Ry. Co.....	50	1,000,000	1,000,000	—	75	76	Empire & Bay States Tel. Co.....	100	—	—	—	100	150
aPhiladelphia City Pass. Ry.....	50	1,000,000	1,000,000	—	75	76	Hudson River Telephone Co.....	100	2,000,000	2,000,000	1% Q. Jan.	100	150
aPhiladelphia & Gray's Ry. RR.....	50	1,000,000	1,000,000	—	75	76	*Northwestern Telephone Co. guar.....	100	2,000,000	2,000,000	1% Q. Jan.	100	150
aBridge Avenue Passenger Ry.....	50	750,000	750,000	—	75	76	Providence (R. I.) Tel. Co.....	50	—	—	—	50	99
aPhiladelphia & Dart. Ry. guar.....	50	—	—	—	75	76	Southern New Eng. Tel. Co.....	100	8,000,000	8,000,000	—	100	150
a17th & 19th Sts. Pass. Ry. guar.....	50	—	—	—	75	76	ELECTRIC LIGHT AND ELECTRICAL MFG. COS. Boston, Mass.—Apr 8 Fort Wayne Electric Trust receipts.....	25	—	—	—	25	125
aThirteenth & 15th Sts. Pass. Ry.....	50	1,000,000	1,000,000	—	75	76	Fort Wayne Elec. Co. T. Sec. Series A.....	25	—	—	—	25	125
aUnion Passenger Ry. Co.....	50	1,500,000	1,500,000	—	75	76	General Electric Co. (old) com.....	100	40,000,000	40,000,000	2% Q. Aug. 1898.	100	215
aWest Philadelphia Pass. Ry.....	50	750,000	750,000	—	75	76	General Electric Co. (new) com.....	100	18,375,000	18,375,000	1% Q. Apr. 1900.	100	215
Rochester, N. Y. —Apr 8 Rochester Railway Co.....	100	5,000,000	5,000,000	—	20	23	T. H. Elec. Co. T. Sec. Series C.....	50	—	—	—	50	125
Reading, Pa. —Apr 8 Reading Traction Co.....	50	1,000,000	1,000,000	Semi-an. Jan. & July '98.	24	26	Westinghouse Elec. & Mfg. Co. com.....	50	4,000,000	4,000,000	1% Q. Jan.	50	125
aCity Passenger Ry.....	50	850,000	850,000	Jan. '98.	125	—	Westinghouse El. & Mfg. Co. pfd.....	50	4,000,000	4,000,000	1% Q. Jan.	50	125
aEast Reading Electric Ry.....	50	1,000,000	1,000,000	Jan. '98.	70	—	Westinghouse El. & Mfg. Co. assent.....	50	11,000,000	11,000,000	—	50	125
St. Louis, Mo. —Apr 8 Fourth Street & Arsenal Ry.....	50	800,000	150,000	—	—	—	New York. —Apr 8 Edison Elec. Ill. Co., New York.....	100	2,125,000	2,125,000	1% Q. Oct. '98.	100	125
aJefferson Avenue Ry. Co.....	50	400,000	400,000	—	—	—	*Edison Elec. Ill. Co., Brooklyn.....	100	4,000,000	4,000,000	1% Q. Oct. '98.	100	125
aLindell Ry.....	50	2,500,000	2,400,000	—	—	—	Edison Ore. Milling Co.....	100	—	—	—	100	125
aNational Railway Co.....	50	2,500,000	2,475,000	—	—	—	Electric Vehicle Co.....	100	—	—	—	100	125
aCass Avenue & Fair Grounds.....	50	2,500,000	2,500,000	—	—	—	*General Electric Co. (old) com.....	100	40,000,000	40,000,000	2% Q. Aug. 1898.	100	215
aOtisville RR.....	50	2,000,000	1,500,000	—	—	—	General Electric Co. (new) com.....	100	18,375,000	18,375,000	1% Q. Apr. 1900.	100	215
aSt. Louis RR.....	50	2,000,000	2,000,000	—	—	—	Interior Conduit & Insulation Co.....	100	1,000,000	1,000,000	—	100	125
aMissouri RR.....	50	2,400,000	2,800,000	—	—	—	*Kings Co. El. L. & P. Co.....	100	2,500,000	2,500,000	A. & O.	100	125
aPeople's RR. Co.....	50	1,000,000	800,000	—	—	—	Pittsburg, Pa. —Apr 8 Allegheny County Light Co.....	100	500,000	500,000	J. & J. Q.	100	125
aUnited Electric Ry.....	50	500,000	500,000	—	—	—	East End Electric Light Co.....	50	500,000	500,000	—	50	125
aUnited Electric Ry.....	50	1,000,000	1,000,000	—	—	—	Philadelphia, Pa. —Apr 8 Edison Electric Light Co.....	100	2,000,000	2,000,000	—	100	125
aSt. Louis & Suburban Ry.....	100	3,000,000	2,500,000	—	—	—	*Electric Storage Battery Co. com.....	100	5,000,000	5,000,000	—	100	125
aUnion Depot RR.....	100	4,000,000	4,000,000	—	—	—	*Electric Storage Battery Co. pfd.....	100	5,000,000	5,000,000	—	100	125
San Francisco, Cal. —Apr 8 California St. Cable RR.....	100	1,000,000	600,000	—	117	119	Northern Elec. Light & Power Co.....	10	500,000	500,000	—	10	125
aGeary Street Park & Ocean RR.....	100	1,000,000	875,000	—	50	—	Southern Elec. Light & Power Co.....	10	127,500	127,500	—	10	125
aMarket Street Ry.....	100	18,750,000	18,750,000	—	61	63	Miscellaneous. —Apr 8 Bridgeport (Conn.) Elec. Lt. Co.....	25	800,000	800,000	—	25	125
aPresidio & Ferries RR.....	100	1,000,000	550,000	—	16	—	Missouri-Edison (St. Louis) com.....	25	—	—	—	25	125
Seranton, Pa. —Apr 8 Seranton Railway Co.....	50	6,000,000	2,500,000	—	29	30	Eddy Electric Mfg. Co.....	25	—	—	—	25	125
aSeranton & Carbonate Trac. Co.....	100	500,000	500,000	—	16	—	Hartford (Conn.) Elec. Light Co.....	100	850,000	850,000	—	100	125
aSeranton & Pittston Traction Co.....	100	1,050,000	1,050,000	—	—	—	Hartford (Conn.) Lt. & Power Co.....	25	175,000	175,000	—	25	125
Springfield, Ill. —Apr 8 Springfield Consolidated Ry.....	100	750,000	750,000	—	—	—	New Haven (Conn.) Elec. Lt. Co.....	100	100,000	100,000	—	100	125
Springfield, O. —Apr 8 Springfield Street Ry.....	100	1,000,000	1,000,000	—	—	—	Narragansett (Prov., R.I.) Elec. Co.....	50	1,200,000	1,200,000	—	50	125
Springfield, Mass. —Apr 8 Springfield Street Ry.....	100	1,300,000	1,166,700	—	207	212	Rhode Island Elec. Protec. Co.....	100	—	—	—	100	125
Toronto, Canada. —Apr 8 Toronto Street Ry.....	100	6,000,000	6,000,000	—	106	108	Royal Elec. Co. (Montreal).....	100	1,250,000	1,250,000	—	100	125
aMontreal Street Railway Co.....	100	4,000,000	4,000,000	—	272	265	Toronto (Canada) Elec. Light Co.....	100	1,000,000	1,000,000	—	100	125
Washington, D. C. —Apr 8 Belt Ry. Co.....	50	500,000	500,000	—	—	—	Thomson-Houston Welding Co.....	100	—	—	—	100	125
aCapital Traction Co.....	100	12,000,000	12,000,000	—	102	102	Woonsocket (R. I.) Electric Co.....	100	—	—	—	100	125
aColumbia Ry. Co.....	50	400,000	400,000	—	—	—	Allied Industries. Boston, Mass.—Apr 8 American Electric Heating Co.....	50	10,000,000	10,000,000	—	50	125
aBakington & Soldiers' Home Ry.....	50	707,000	652,000	—	28	21	Street Ry. & Ill. Properties.....	100	4,500,000	4,500,000	—	100	125
aGeorgetown & Tenallytown Ry.....	50	300,000	200,000	—	—	—	United Electric Securities Co.....	100	—	—	—	100	125
aMetropolitan RR. Co.....	50	1,000,000	458,900	—	—	—	New York. —Apr 8 Consolidated Electric Storage Co.....	100	—	—	—	100	125
Worcester, Mass. —Apr 8 Worcester Traction Co.....	100	3,000,000	3,000,000	—	3	35	Safety Car Heating & Lighting Co.....	100	—	—	—	100	125
aWorcester Traction Co.....	100	2,000,000	2,000,000	—	105	106	Worthington Pump Co.....	100	5,500,000	5,500,000	—	100	125
aWorcester & Suburban Street Ry.....	100	550,000	542,500	—	—	—	Worthington Pump Co.....	100	2,000,000	2,000,000	—	100	125
Wilkesbarre, Pa. —Apr 8 Wilkesbarre & Wyoming Val Trac.....	100	5,000,000	5,000,000	—	25	29	Philadelphia, Pa. —Apr 8 Electric Pneumatic Trans. Co.....	10	1,500,000	1,500,000	—	10	125

* Unlisted. † Paid in. ‡ Full paid. § Outstanding. ¶ Ex-div.
 a Leased to Hestonville, Man. & Fairmount Passenger Ry. for 6% on stock per annum.
 b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
 c Practically all shares owned by Union Traction Company.
 d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
 e Leased to Electric Traction Company.
 f Controlled by Frankford & Southwark Passenger Railway.
 g Leased to People's Passenger Railway at \$5 per share.
 h Majority of stock owned by People's Traction Company.
 i Leased to Union Traction Company.
 j Lease transferred to Union Traction Company.
 k Leased to United Traction Company at a rental of \$10,000 per annum in 1898-7-8, \$20,000 in 1899-1900 and \$30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.
 l Dividend of 10% guaranteed by Reading Traction Company.
 m Dividend of 6% guaranteed by Reading Traction Company.
 n Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

† On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to \$20,827,200, of which \$18,276,000 is common and \$2,551,200 preferred.
 ‡ Recently acquired the Edison Illuminating Co. of Brooklyn and its operating company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

Boston, Mass. —Apr 8 American Electric Heating Co.....	50	10,000,000	—	—	—	—	New York. —Apr 8 Consolidated Electric Storage Co.....	100	—	—	—	—	—
Street Ry. & Ill. Properties.....	100	4,500,000	1,248,700	—	—	—	Safety Car Heating & Lighting Co.....	100	—	—	—	—	—
United Electric Securities Co.....	100	—	1,000,000	—	—	—	Worthington Pump Co.....	100	5,500,000	5,500,000	—	—	—
Philadelphia, Pa. —Apr 8 Electric Pneumatic Trans. Co.....	10	1,500,000	—	—	—	—	Worthington Pump Co.....	100	2,000,000	2,000,000	—	—	—
United Gas Improvement Co. scrip.....	50	10,000,000	—	—	—	—	Philadelphia, Pa. —Apr 8 Electric Pneumatic Trans. Co.....	10	1,500,000	1,500,000	—	—	—
Welsbach Commercial Co. com.....	100	2,500,000	—	—	—	—	United Gas Improvement Co. scrip.....	50	10,000,000	—	—	—	—
Welsbach Commercial Co. pfd.....	100	500,000	—	—	—	—	Welsbach Commercial Co. com.....	100	2,500,000	—	—	—	—

ELECTRICITY.
BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

NAME.		Amount.		Due	Interest periods.	Bid.	Asked.	NAME.		Amount.		Due	Interest periods.	Bid.	Asked.
		Authorized.	Issued.							Authorized.	Issued.				
Albany N. Y.															
Date of Quotation—Apr 8, 1901															
The Albany Ry. Co.....Cons. mtg. 5s.	\$500,000	437,500	1980	J. & J.	118	119									
The Albany Ry. Co.....Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	*116 1/2										
Watervliet Turnpike & RR. 1st mtg. 5s.	850,000	850,000	1919	M. & N.	*125										
Watervliet Turnpike & RR. 2d mtg. 5s.	150,000	150,000	1919	M. & N.	*124 1/2	127									
Troy City Railway Co.....1st 5s	.....	.....	1942	.....	*116										
Interest guar. by Albany Ry. Co. [Principal and interest guar. by Albany Ry. Co.]															
Baltimore Md.															
Date of Quotation—Apr 8, 1901															
United Electric Ry. Co., 1st mtg. g. 4s.	88,000,000	18,000,000	1949	M. & S.	102	102 1/2									
.....Income 4s.	14,000,000	.....	1949	J. & D.	74 3/4	75									
Baltimore City Pass. Ry., 1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118 1/2										
Baltimore Traction Co., 1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120									
Baltimore Trac. Co. Ext. & Imp. g. 5s.	1,250,000	1,250,000	1901	M. & S.	104 1/2										
Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s.	1,750,000	1,750,000	1942	J. & D.	121	121 1/2									
Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s.	750,000	.....	1900	J. & J.	101										
Baltimore Traction Co. Convertible 5s.	800,000	.....	1906	N. & M.	102 1/2										
Central Pass. Ry. Co., 1st mtg. 5s.	96,000	117,000	1912	J. & J.	.....										
Central Pass. Ry. Co., Cons. mtg. g. 5s.	604,000	580,000	1912	M. & N.	119	121									
City & Suburban Ry., 1st mtg. g. 5s.	8,000,000	8,000,000	1922	J. & D.	116	117									
Lake Roland Elev., 1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117										
All of the bonds of the above companies, marked f, have been assumed by the United Railways & Electric Company.															
Boston Mass.															
Date of Quotation—Apr 8, 1901.															
Lynn & Boston RR., 1st mtg. g. 5s.	5,879,000	3,702,000	1924	J. & D.	114	115									
West End Street Ry., Deben. g. 5s.	8,000,000	3,000,000	1902	M. & N.	104 1/2	106									
West End Street Ry., Deben. g. 4 1/2s.	2,000,000	2,000,000	1914	M. & S.	112										
\$1,074,000 in escrow to retire outstanding bonds of absorbed companies.															
Charleston S. C.															
Date of Quotation—Apr 8, 1901.															
Enterprise Street RR., 1st mtg. 5s.	500,000	47,000	1906	J. & J.	.....	.....									
Charleston City Ry., 1st mtg. 6s.	850,000	.....	.....	J. & J.	106	.....									
Controlled by Charleston St. Ry. Co.															
Chicago Ill.															
Date of Quotation—Apr 8, 1901.															
Chicago City Ry., 1st mtg. 4 1/2s.	6,000,000	4,619,500	1901	J. & J.	101 1/2	2 1/2									
Chicago Passenger Ry., 1st mtg. 6s.	400,000	400,000	1908	F. & A.	.....	102									
Chicago Passenger Ry., Cons. mtg. 6s.	1,000,000	600,000	1929	J. & D.	.....	.....									
Chicago & So. Side R. T., 1st mtg. g. 5s.	7,500,000	7,500,000	1929	A. & O.	.....	.....									
Chicago & So. Side R. T., 2d mtg. g. 5s.	1,500,000	750,000	1907	J. & J.	.....	.....									
Chicago West Div. Ry., 1st mtg. 4 1/2s.	4,040,000	4,040,000	1982	J. & J.	108 1/2	109									
Lake Street Elevated RR., 1st mtg. g. 5s.	7,974,000	8,781,200	1928	J. & J.	.....	.....									
Metrop. W. Side Elev. Ry., 1st mtg. g. 5s.	15,000,000	15,000,000	1942	F. & A.	96	96 1/2									
North Chicago St. RR., 1st mtg. 5s.	8,171,000	8,171,000	1906	J. & J.	106	.....									
North Chicago St. RR., Cert. Indeb. 6s.	600,000	600,000	1911	J. & J.	.....	.....									
North Chicago City Ry., 1st mtg. 6s.	600,000	600,000	1900	J. & J.	.....	.....									
North Chicago City Ry., consol. 4 1/2s.	2,500,000	2,500,000	1927	M. & N.	108	.....									
West Chicago St. RR., 1st mtg. 5s.	4,100,000	8,989,000	1928	M. & N.	.....	111									
West Chicago St. RR., Deben. 6s.	2,700,000	700,000	1911	J. & D.	101	102									
West Chicago St. RR., Cons. mtg. g. 5s.	12,500,000	6,000,000	1986	.....	106 1/2	107									
W. Chicago St. RR. Tunnel, 1st mtg. 5s.	1,500,000	1,500,000	1909	F. & A.	.....	.....									
Redeemable at option on 60 da. notice.															
Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.															
Subject to call after Oct. 1, 1899, at \$110 and interest.															
Assumed by W. Chi. RR. Co., lessee.															
Int. guar. by W. Chicago St. RR. Co.															
Cincinnati, O.															
Date of Quotation—Apr 8, 1901															
Cin. New & Cov. St. Ry. 1st Cons. mtg. g. 5s.	5,000,000	2,500,000	1922	J. & J.	114 1/2	115									
Mt. Adams & Eden Pk In., 1st mtg. 6s.	46,000	46,000	1900	A. & O.	108 1/2	104									
Mt. Adams & Eden Pk In., 1st mtg. 6s.	100,000	100,000	1905	A. & O.	114	.....									
Mt. Adams & Eden Pk In. Cons. mtg. 5s.	581,000	581,000	1906	M. & S.	108 1/2	.....									
So. Cov. & Cin. St. Ry., 1st mtg. 6s.	250,000	250,000	1912	M. & S.	121 1/2	122 1/2									
So. Cov. & Cin. St. Ry., 2d mtg. 6s.	400,000	400,000	1982	J. & J.	182 1/2	187									
Assumed by the Cin. St. Ry. Co.															
\$250,000 reserved to retire 1st mtg. bds.															
Cleveland O.															
Date of Quotation—Apr 8, 1901															
Brooklyn Street RR. Co., 1st mtg. 5s.	600,000	600,000	1908	M. & S.	106 1/2	107									
Cin. New & Cov. St. Ry., Cons. mtg. 5s.	8,000,000	2,800,000	1922	J. & J.	118 1/2	114 1/2									
Cleveland City Cable Ry., 1st mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	106 1/2	106									
Cleveland Electric Ry. Co. 1st mtg. g. 5s.	8,500,000	1,249,000	1918	M. & S.	106	107									
Columbus (O.) Cent. Ry., 1st mtg. g. 5s.	1,500,000	1,500,000	1910	M. & N.	.....	.....									
East Cleveland RR., 1st mtg. 5s.	1,000,000	1,000,000	1918	M. & S.	.....	107 1/2									
Fl. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s.	900,000	.....	1922	M. & N.	.....	.....									
Lorain (O.) Street Ry., 1st mtg. 6s.	200,000	200,000	1915	J. & J.	.....	.....									
St. Ry. Co., Grand Rapids., 1st mtg. 5s.	600,000	600,000	1912	J. & D.	.....	.....									
\$1,900,000 in escrow to retire bonds of absorbed companies, marked a.															
Interest guar. by Cons. St. Ry. Co.															
Detroit, Mich.															
Date of Quotation—Apr 8, 1901.															
Detroit Citizens' St. Ry., 1st mtg. 5s.	7,000,000	8,888,000	1905	A. & O.	.....	102 1/2									
Fl. Wayne & Belle Isle Ry., 1st mtg. 6s.	400,000	877,000	1902	A. & O.	.....	.....									
The Detroit Ry., 1st mtg. 6s.	1,800,000	1,800,000	1926	J. & D.	105	106 1/2									
\$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.															
New Haven Conn.															
Date of Quotation—Apr 8, 1901															
New Haven St. Ry., 1st mtg. g. 5s.	600,000	600,000	1918	.....	111	.....									
New Haven (Edgewood Div.) 1st mtg. 5s.	250,000	250,000	1914	J & D	111	.....									
Windsor Avenue RR—1st mtg. g. 5s.	100,000	500,000	1912	M & N	109	.....									
Windsor Avenue RR., Deben. g.	100,000	24,000	1912	M & S	.....	.....									
New Orleans La.															
Date of Quotation—Apr 8, 1901															
Canal & Claiborne RR., cons mtg. 5s.	\$150,000	\$150,000	1912	M. & N.	.....	.....									
Crescent City RR., 1st mtg. 6s.	.....	50,000	1899	M. & N.	106 1/2	.....									
Crescent City RR., Cons. mtg. g. 5s.	5,000,000	8,000,000	1948	J. & J.	.....	.....									
New Orleans City RR., 1st mtg. g. 5s.	418,500	899,000	1908	J. & D.	108	112									
N. Orl's City & Lake RR., 1st mtg. g. 5s.	5,000,000	2,599,500	1948	J. & J.	112	118									
N. Orleans & Carrollton RR. 2d mtg. g. 6s.	850,000	850,000	1907	F. & A.	.....	.....									
Orleans Railroad Co., Cons. mtg. 6s.	800,000	800,000	1912	J. & J.	.....	.....									
St. Charles St. RR. Co., 1st mtg. 6s.	800,000	75,000	1906	J. & D.	.....	.....									
\$425,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.															
\$900,000 outstanding.															
New York.															
Date of Quotation—Apr 8, 1901.															
Atlantic Ave. (Brooklyn), Imp. g. 5s.	1,500,000	1,500,000	1984	J. & J.	95	.....									
Atlantic Av. (Brooklyn), 1st mtg. 5s.	759,000	759,000	1909	M. & S.	107 1/2	110									
Atlantic Av. (Brooklyn), Cons. mtg. 5s.	8,000,000	1,968,000	1981	A. & O.	115	116									
Bro'dway & 7th Ave. 1st cons. mtg. g. 5s.	12,500,000	7,650,000	1948	J. & D.	128	128 1/2									
Bro'dway & 7th Ave. 2d mtg. g. 5s.	1,500,000	1,500,000	1904	J. & D.	104	106 1/2									
Bro'dway & 7th Ave. 2d mtg. 5s.	500,000	500,000	1914	J. & J.	108	110 1/2									
Bro'dway Surface, 2d mtg. 5s.	1,125,000	1,125,000	1924	.....	115	117									
Brooklyn City RR. Co. 1st cons. mtg. 5s.	1,000,000	1,000,000	1905	.....	105	106									
Brooklyn City & Newtown, 1st mtg. 5s.	6,000,000	6,000,000	1941	J. & J.	116	117									
Brooklyn City & Newtown, 1st mtg. 5s.	2,000,000	2,000,000	1939	J. & J.	115	116									
Brooklyn Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1983	J. & J.	101	.....									
Brooklyn Heights RR., 1st mtg. 5s.	250,000	250,000	1941	A. & O.	104	.....									
Brooklyn Q's Co. & Sub'n., 1st mtg. 5s.	8,500,000	8,500,000	1941	J. & J.	112	.....									
Brooklyn Q's Co. & Sub'n., 1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	.....									
Brooklyn Rapid Transit, gold 5s.	7,000,000	5,181,000	1945	.....	109 1/2	109 1/2									
Bleecker St. & Fulton Ferry RR. 1st mtg. 7s.	700,000	700,000	1900	.....	98 1/2	100 1/2									
Cent Pk. N. & E. R. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	1075										

PASSENGER RAILWAY.

NAME	Amount.		Due	Interest periods.	Bid.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—Apr 8 1931						
Jefferson Avenue Ry.....1st mtg. 6s.	270,000	270,000	1908	M. & N.	112	113
Lindell Ry. Co.....1st mtg. 6s.	1,800,000	1,800,000	1911	F. & A.	117	118
Missouri RR. Co.....1st mtg. 6s.	1,000,000	700,000	1916	M. & S.	106	106
Mount City RR. Co.....1st mtg. 6s.	400,000	800,000	1910	A. & O.	104½	105½
People's RR. Co.....1st mtg. 6s.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 7s.	75,000	75,000	1903	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric.....1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 6s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
St. Louis & Sub. Ry.....1st mtg. 6s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 6s.	800,000	800,000	.....	.....	80	84
Southern Electric Ry.....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	106
Taylor Avenue St. Ry.....1st mtg. 6s.	500,000	500,000	1918	J. & J.	116½	117½
Union Depot RR. Co.....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.....Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122
†Controlled by St. Louis RR. Co.						
†Controlled by Union Depot RR. Co.						
†Controlled by Lindell RR. Co.						
†\$200,000 in escrow to retire 1st & 2d mtg.						
†\$200,000 in escrow.						
†\$200,000 in escrow to retire 1st mtg. 6s.						
San Francisco Cal.						
Date of Quotation—Apr 8 1931						
California St. Cable RR.....1st mtg. 6s.	1,000,000	900,000	1915	J. & J.	114	117
Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	.....	117
Geary St., Park & Ocean RR.....1st mtg. 6s.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. 6s.	8,000,000	8,000,000	1918	J. & J.	126½	.....
Metropolitan Ry. Co.....1st mtg.	2,000,000	2,000,000	1918	A. & O.	126½	.....
Omnibus Cable Co.....1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
Park & Cliff House RR.....1st mtg. 6s.	250,000	250,000	1914	J. & J.	115	.....
Park & Ocean RR.....1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Powell St. Ry.....1st mtg. 6s.	1,000,000	900,000	1918	M. & N.	.....	.....
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Apr 8 1931						
Met. Ry. Co.....Cons. mtg. 6s.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....Cons. mtg. 6s.	500,000	500,000	1914	A. & O.	182	.....
Belkington & Soldiers' Home.....1st mtg. 6s.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	.....	.....
†\$50,000 in escrow to retire 1st mtg. bds.						
Miscellaneous						
Date of Quotation—Apr 8 1931						
Bridgeport Traction Co.....1st mtg. 6s.	2,000,000	1,682,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 6s.	5,000,000	3,542,000	1931	F. & A.	118	.....
City of Buffalo (N. Y.) Ry. Co.....1st cons. m. 6s.	4,000,000	3,000,000	1928	M. & N.	104	105
Greenwich St. Ry. (Buffalo).....1st mtg. 6s.	8,000,000	2,856,000	1922	M. & N.	112	118
Columbus (O.) St. Ry.....1st cons. g. 6s.	8,000,000	2,261,000	1922	J. & J.	115	.....
Consolidated Traction (N. J.).....1st mtg. 6s.	15,000,000	18,965,000	1928	J. & D.	111½	111½
Consolidated Traction (N. J.).....2d mtg. 6s.	2,000,000	872,000	1928	J. & D.	115	115½
Denver City Cable Ry.....1st mtg. g. 6s.	4,000,000	3,800,000	1920	J. & J.	20	85
Denver Con. Tramway Co.....Con. m. g. 6s.	4,000,000	922,000	1928	A. & O.	80	85
Louisville (Ky.) Ry.....1st cons. mtg. g. 6s.	6,000,000	4,981,000	1920	J. & J.	119	119½
Minneapolis St. Ry. (N. J.).....1st cons. mtg. g. 6s.	5,000,000	4,050,000	1919	J. & J.	110½	110½
Mo. Hudson Co. Ry. (N. J.).....Cons. mtg. 6s.	8,000,000	2,878,000	1928	J. & J.	108	.....
Mo. Hudson Co. Ry. (N. J.).....2d mtg. 6s.	550,000	550,000	1928	M. & N.	.....	.....
Mo. Hudson Co. Ry. (N. J.).....Deb. 6s.	500,000	489,000	1902	F. & A.	.....	.....
Paterson (N. J.) Ry.....Cons. mtg. g. 6s.	1,250,000	1,000,000	1921	J. & D.	.....	.....
Paterson (N. J.) Ry.....1st mtg. 6s.	8,000,000	2,000,000	1920	A. & O.	.....	.....
Rocheester (N. Y.) Ry.....Cons. g. 6s.	5,500,000	4,238,000	1927	.....	105½	106
St. Paul City Ry.....Cons. g. 6s.	1,000,000	1,000,000	1900	.....	108	.....
†\$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
†\$200,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
†\$750,000 in escrow to retire bonds of C. St. Ry. Co.						
†\$200,000 in treasury.						
†\$200,000 reserved to redeem prior issue.						
†\$250,000 in escrow.						

*With int' res

ELECTRIC LIGHT AND ELECTRICAL MFG. CO'S

Boston, Mass.						
Date of Quotation—Apr 8 1931						
Delaware Gas Lt. Co.....1st m. 6s. g.	800,000	800,000	...	J. & J.	106	106
Edison Elec. Illuminating Co., Boston.....	2,026,000	8,750,000	1922	Quar.	116	...
General Electric Co., gold coup. deb. 6s.	10,000,000	...	...	...	...	...
Pittsburg Pa.						
Date of Quotation—Apr 8 1931						
Allegheny County Light Co.....6s.	500,000	...	1911	J. & J.	110	...
Westinghouse Elec. & Mfg. Co. Scrip 6s.	198,570	...	...	M. & S.	...	...
Miscellaneous.—(Apr 8 1931.)						
Edison El. Ilig. Co. (N. York) 1st m. 6s.	4,812,000	4,812,000	1910	...	109	...
Edison El. Ilig. Co. (N. York) con. m. g. 6s.	15,000,000	2,188,000	1938	...	124	...
Edison Elec. Ilig. Co. (Brooklyn).....	5,030,000	5,000,000	1940	...	122½	124
Edison Electric Light (Philadelphia).....	2,030,000	...	...	...	...	...
Edison Co. El. Lt. & Pow. Co. 1st mtg. 6s.	2,500,000	...	1927	A. & O.	100	101
Kings Co. El. Lt. & Po. Co. pur. money 6s.	5,178,000	...	1927	A. & O.	120	122
Milwaukee El. Ry. & Lt. Co. 1st con. g. 6s.	8,000,000	...	...	F. & A.	102½	...
United Elec. Light & Power Co. (N. Y.).....	5,000,000	...	...	...	...	...

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—Apr 8 1931						
American Bell Telephone.....4s.	...	...	1908	F. & A.	100½	101
Northwestern Telephone Co.....7s.	...	...	...	...	114	115
N. Y. & N. J. Telep. & Tel. Co. gen. mtg. 6s.	...	...	1911	J. & D.	108	116
Chesapeake & Potomac Teleph. Co.....6s.	...	...	...	...	...	...

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—Apr 8 1931						
American Electric Heating.....7s.	500,000	500,000	...	...	...	25
Armstrong & Sims Engine Co.....6s.	...	...	1942	J. & J.	106	107
Barnes & Smith Car Co.....6s.	...	...	1904	J. & D.	...	...
Carborandum Mfg Co.....6s.	75,000	...	...	...	115	127
Washington Pump Co.....	...	...	...	...	...	...
†Nominal.						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16¾c.; Lake, 16½@16¾c.; casting, 16½@16¾c.

The annual meeting of General Electric stockholders will be held in Schenectady, N. Y., May 14.

The stockholders of the Illinois Electric Vehicle Transportation Company have voted in favor of going out of business.

The Knickerbocker Trust Company of New York wishes to buy American Electric Telephone Company 6 per cent. debentures.

The Farmers' Loan and Trust Company of New York wishes to buy \$21,000 Helena Water and Electric Power Company first mortgage bonds.

The Scranton and Wilkes-Barre Rapid Transit Company have awarded a contract of \$1,155,000 to the Westinghouse Company for the electrical equipment of the road.

The report of the United Traction Company of Albany, N. Y., for four weeks ending March 28 shows receipts of \$99,534.91, as compared with \$95,912.76 for the same period last year, a gain of \$3,622.14.

The American Home Telephone Company, capital, \$2,000,000, was incorporated at Trenton, N. J., on the 5th inst. The incorporators are Alfred George Brown, Edward T. Hawkins and Edward T. Magoffin.

A syndicate of Baltimoreans has purchased the San Francisco and San Mateo Electric Railway of San Francisco, for \$1,600,000. The road runs through a rich fruit producing country. It is the purpose to extend the road to San Jose.

The following are quotations for some of the industrial stocks not quoted elsewhere: Electrical Lead Reduction, 4¼@5; Electric Boat, 22@22½; Electric Vehicle, 10¼@13; Tel. & Tel. Company of America (full paid) 6¼@6½; Electric Company of America, 8¼@8½.

The Telegraph, Telephone and Cable Company of America on April 2 filed papers with the Secretary of State at Trenton, N. J., reducing its authorized capital stock from \$30,000,000 to \$9,000,000. This was done by reducing the par value of its shares from \$50 to \$15.

According to a dispatch from Baltimore efforts are being made to construct a continuous trolley system from New York to Washington by the way of Philadelphia, Wilmington and Baltimore. Financial interests in Cleveland have offered to subscribe \$1,500,000 toward the project.

The consolidation of the principal lighting and heat interests in Montreal was accomplished on the 4th inst., when the Montreal Light, Heat and Power Company was organized with a capital of \$17,000,000. The company will absorb the Montreal Gas Company, the Royal Electric Company and the Chambly Manufacturing Company.

N. W. Harris & Co., of New York, Chicago and Boston offer \$400,000 first mortgage 5 per cent. gold bonds of the Dayton Electric Light Company, of Dayton, O., redeemable at 107½ and interest after March 1, 1906. They are issued to refund an old issue of 6 per cents and are part of an issue of \$500,000, secured by first lien on the entire property.

The annual report of the General Electric Company will be issued in a few days. It is believed that the net profits will not reach \$7,000,000, or quite 30 per cent. upon the present outstanding capital stock. All but about \$1,000,000 bonds have been converted into stock. When these have been converted the total capital will be \$25,000,000, of which a little more than \$2,000,000 will be preferred.

The failure of the New England Electric Vehicle and Transportation Company to operate profitably falls most heavily upon New York parties, as two-thirds of the 223,498 shares of stock outstanding are held in New York, says the Boston "News Bureau." There are about 450 stockholders. A majority of the stock has agreed to liquidate, although it will take a two-thirds vote of the stockholders to proceed with the plans for liquidation. The stock is selling in New York at 2¼@2½, although the cash on hand and real estate at cost price to the company figure a liquidating value of \$3.54 per share and it is believed that the company will return stockholders nearly \$5 per share in final liquidation.

The combination of all the big lighting companies of Cincinnati is now assured, as the directors of the various companies have formally accepted the terms submitted from the North American Company through the board of arbitrators. The companies entering into the combine and the percentages allotted them by the arbitrators are as follows: Per cent.—The Cincinnati Gas Light and Coke Company, 68.80; the Cincinnati Edison Electric Company, 27.65; the Jones Bros. Electric Company, 3.29; the Brush Electric Light Company, .05; the First Cincinnati Edison Electric Company, .30; total 100. In monetary value the amounts are: Cincinnati Gas Company, \$19,264,000; Cincinnati Edison Company, \$7,742,000; Jones Bros. Company, \$896,000; Brush Electric Company, \$14,000; First Cincinnati Edison Company, \$84,000; total, \$28,000,000.

Another big consolidation is about to be launched under the name of the American Light and Traction Company. Its scope is similar to that of the United States Steel Corporation, and its financial plan is almost identical with that company; but in the present instance the gas and traction enterprises, with which Emerson McMillan, of New York, is connected, will be merged into one corporation. It is expected that when the consolidation is completed there will be at least twenty gas, electric light and traction companies combined, with a capitalization of \$50,000,000. The charter of the new company was taken out in New Jersey Saturday, with a nominal capital stock of \$2,000. Like the United States Steel Corporation this amount is merely for the purpose of getting the scheme into a corporate shape, and the capital figures will be increased from time to time until the amount is sufficient to take in all the companies to which the offer of consolidation is made.

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EDITORIAL NOTES.

The General Electric Company's Report.

The advance sheets of the
General Electric Company's
ninth annual report for the
year ended January 31,
have been given out. Ac-
cording to the figures there
was a profit of \$6,243,792,
and a net balance of \$4,275,502 after deducting
all dividends. The orders received during
the year aggregated \$27,969,541, against
\$26,323,626 the previous year, and \$11,170,319 in
the year ended January 31, 1897. As has here-
tofore been our custom, we shall publish the
report in full in an early issue of *ELECTRIC-
ITY*.

* * *

Stray Trolley Currents and Brooklyn Water Mains.

The destruction of
water and gas pipes
by electrolysis is
troubling municipal
officials in every part
of the country. Wherever the overhead trol-
ley is to be found in a thickly settled commu-
nity, defective pipes sooner or later invariably
make their appearance. As might readily
have been foreseen Brooklyn is the city to
whose underground metal structures the great-
est damage is threatened, and in view of the
numerous overhead trolley systems in that
community the only wonder is that the water
and gas mains have not been destroyed long
ago. Deputy Commissioner Kirwin of the
Department of Public Buildings, Lighting and
Supplies has been giving the matter his atten-
tion, and has drawn Commissioner Kearny's
attention to the existing state of affairs. In
his communication to Commissioner Kearny,
Deputy Commissioner Kirwin says, in part, as
follows:

"That this borough's gas pipes, water pipes,
Edison tubes, cable armors, etc., are experi-
encing rapid decay through the ravages of
electricity cannot be denied; nor is it a hard
matter to demonstrate that the beginnings of
electrolytic trouble were coincident with the
adoption of the single trolley system in this
borough. As far back as 1893 the Board of
Commissioners of Electrical Subways became
cognizant of the evil and instituted an elec-
trical survey of the City of Brooklyn. A resur-
vey was undertaken in 1896 by the board. The
solution of the problem is a matter of no small
moment.

"The importance of the subject cannot be
overestimated. The impediment to efficient
fire protection caused by leaky mains, to say
nothing of inconvenience and expense due
to failing gas, water, telephone and electric
light service, is enough to demand an investi-
gation of the most thorough nature. Indeed,
the rapid failure of some of our recently laid
asphalt pavements is charged against gas leaks,
for which the gas companies are endeavoring
to hold electrolysis responsible.

"Brooklyn, it appears, is not the only victim
of this evil. Throughout the country the same
troubles seem to have been met with. The
consulting engineer of lighting and electricity
should be requested to prepare a preliminary
report, outlining the plan to be employed in
properly investigating the subject, and this de-
partment should be authorized to designate
the head of its Bureau of Electricity and Gas
to assist in the preparation of said report."

In a city such as Brooklyn, where are to be
found miles upon miles of overhead trolley
lines, the problem of preventing current from
straying from its rightful path will prove a
most difficult one to solve. Thorough bonding
of the rails will no doubt tend to remedy the
evil, but it is very questionable whether it
would obviate it entirely. The truth of the
matter is that a city such as Brooklyn should
have the conduit system as is to be found in
New York, but of course it would be out of
the question to undertake to compel the Brook-
lyn Rapid Transit Company to do away with
its present system and substitute the under-
ground conduit, as the expense would be enor-
mous. As this method of procedure is there-
fore out of the question—at least for some
time to come—it only remains for the authori-
ties to insist on the usual precautions and
adopt the remedies that have proven fairly
satisfactory in other localities under similar
trying conditions.

* * *

An Object Lesson in Government Ownership.

Persons who advocate
Government ownership
in this country of the
telegraph and telephone
would do well to examine
carefully into the condi-
tions of these enterprises in Great Britain.
The State purchased the telegraph systems in
England over thirty years ago from half a dozen
competing private companies and eleven years
elapsed before the rates were reduced for the
ordinary citizen. The act of Parliament

authorizing the purchase and providing the necessary funds for the purchase of the systems also gave the British Government a monopoly of electrical communication and placed the administration of the telegraphs in the hands of the Post Office. When the telephone was introduced into that country it was fiercely attacked by the Post Office authorities in the belief that it would supersede the telegraphs. Ultimately, after costly law suits, the courts decided that the telephone came within the terms of the act of Parliament and could not therefore be used in England without the consent and authorization of the Postmaster-General. Referring to the subject a correspondent of the N. Y. "Sun" says:

"The postal men who controlled the telegraph had neither the courage nor the foresight to buy up the American patents, lock, stock and barrel, and go into the telephone business themselves. They therefore issued licenses to private corporations and hedged them around with such manifold restrictions that enterprise was crushed and the telephone system of this United Kingdom became a by-word among the nations. Six years ago the Post Office Rip Van Winkles awoke from their slumbers and again appealed to Parliament to help them. Parliament dutifully passed an act by means of which the Post Office people received funds with which to buy the trunk lines of private corporations, who thenceforward were to be restricted to local exchange business, an arrangement which suited them very well indeed. They obtained for their trunk lines a price about three times their intrinsic value, and they cheerfully accepted the profitable local traffic and gave the Post Office the unprofitable trunk line work. Three years later the Rip Van Winkles again rubbed their eyes and after looking around saw things which displeased them. They asked and obtained Parliamentary powers and funds with which to compete actively with the private corporations, or rather with the one corporation—the National Telephone Company—which had survived the stress of unfair Government interference. As might have been expected, the result of all this muddling, vacillation and inaptitude is that England has the worst telephone system in the whole world. The telephone has not even yet entered into the daily business life of the British people; it is still a luxury, and bids fair to remain so for long years to come."

The writer of the article states that while the Post Office bureaucrats were thus engaged in the congenial occupation of strangling private enterprise in the telephone business and, incidentally, in the district messenger and tape ticker businesses, they allowed their own telegraph business to go to the dogs.

The correspondent continues as follows:

"In 1896 it became evident that a retrograde policy had been deliberately decided upon and enforced, but it was not until three years later that proof was given to the world by the "Telegraph Chronicle," the organ of the telegraphers of the United Kingdom. By some means, which a special departmental committee failed to discover, this enterprising paper obtained and published the confidential report of a secret commission which was appointed in 1895 for the purpose of ascertaining how money could be saved in the administration of the telegraphs. The commission deliberately reported in favor of economy before efficiency. Controlling officers were warned

that money must be saved at all costs, and departmental protection was promised in the event, certain of course to happen, of increased delay in transmission consequent upon the saving of pence. They were urged to give scant consideration to newspaper dispatches, and the golden rule laid down for their guidance was that a minimum staff should be kept for maximum requirements.

"Needless to say the telegraph service was utterly demoralized by these recommendations. Errors and delays became the rule instead of the exception. To-day it is nothing unusual for a press dispatch of less than a hundred words to occupy three to four hours in transmission, say, from London to Dublin, private messages of twelve words very rarely obtain delivery within an hour of handing in, and in London it takes twice as long to send a message from one part of the city to another, a few miles, than it does to telegraph 500 miles to the north of Scotland."

The author concludes in the followings*rain:

"There are few thoughtful men in this country now who do not deplore the existence of the Government monopoly in telegraphic and electrical matters. That monopoly has not only given the country an inferior telegraph service and a disgraceful telephone service—it has strangled many promising enterprises and has driven British talent into seeking foreign outlets, with the result that if an electric outfit is required here for railroad or tramway or what not it has to be obtained almost invariably in the United States. Such are the fruits of Government monopoly and incompetent administration."

The above matter should furnish advocates of Government and municipal ownership with food for thought, and it is to be hoped that the conditions that existed for years in England as regards the telegraph and telephone, will deter Congress from advocating Government ownership of a Philippine cable when one has been laid.

* * *

Roentgen Rays as a Cure for Cancer.

We have referred in these columns several times to various alleged electrical inventions, or more properly speaking, discoveries as a cure for cancer. Some two years ago a Philadelphia physician was credited with having discovered a method of curing this dreaded disease by inserting in the body of a patient nascent salts of mercury by electric diffusion. Whether this method of treating cancer has turned out as efficacious as was hoped by its originator, we are not prepared to say, but word now comes from California that the disease may be cured through the medium of X-rays.

The physician who claims to be able to accomplish this by means of Prof. Roentgen's discovery is a resident of Oakland, and has been experimenting along these lines for several years. He first tried the effect of the X-ray on himself, and succeeded, so the report states, in curing a cancerous growth. Later he treated others with remarkable success. Referring to his method and system he says:

"When the X-ray was discovered, I was merely interested from a purely scientific standpoint. I secured a machine, and after placing a lead mask over my face, entirely covering it where I was afflicted, I began systematic treatment, I found relief from the beginning. Now I am thoroughly cured,

"My theory is that the X-ray kills the molecules which constitute the primal cells, where cancerous life actually begins. It frequently takes thousands of these molecules to make a single cell of the tissue. The deterioration or decay of the molecules, I judge, may cause cancer. It probably does.

"The X-ray has the effect of drying up these atoms, and in time prevents the spread of cancer. Ultimately it kills the disease. I am positive when I say the X-ray can cure cancer."

Although, as previously stated, several electrical methods have been suggested in the past as a cure for cancer, none to our knowledge has proven entirely satisfactory, and such being the case, if the California physician can accomplish what he claims, his experiments will be watched with interest by the medical and scientific world.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

It is stated that a chainless automobile is one of the latest inventions in the motor world.

THE Electrical Machinists and Instrument Makers' Union, which is a branch of the International Association of Machinists, held a meeting recently in Arlington Hall, New York, and decided to join the nine-hour demand of the machinists, which goes into effect on May 20. Both the union and non-union men will make the demand.

THE Electric Vehicle Company has recently been awarded the contract for carrying the mails between the Pan-American Exposition grounds and the Buffalo Post Office. The vehicle has a carrying capacity of 1,000 pounds besides the driver and attendant and will be required to cover 60 miles a day.

RAILS for the extension of the electric lines of Glasgow are to be furnished by American manufacturers, according to cable advices received in this city last week. About 3,450 tons of rails will be required, at a cost of \$110,000. Nearly all of the original equipment of the Glasgow lines also came from the United States.

THE Compania de Ferrocarriles del Distrito Federal de Mexico (The City of Mexico Tramways Company), which concern operates the first electric traction system in that part of the world, is now placing a large number of contracts for American material, equipment, etc., rendered necessary by an extension to the road. Though the company has been solely financed by London bankers, practically everything in the shape of equipment has been purchased in this country. It is estimated that fully \$2,000,000 has been expended in the United States. A St. Louis concern is to execute a contract for the building of twenty trolley-cars, which are to be elaborately fitted with the most up-to-date improvements, and will cost \$6,000 a piece.

A COMBINED fire engine and hose-cart was recently patented, the engine of which is operated by an electric current, whereby the necessity of the steam boiler and fuel supply is dispensed with. As the motive power is electricity, the only apparatus required for

power is a small electric motor, which is located beneath the body of the vehicle, whereby the body of the vehicle may be used for the hose pipe. The motor is connected with the trolley wires of the street car lines, branch wires being run from such street car lines to the various parts of the city where hydrants are located. By this arrangement a comparatively light vehicle may be used, and the power is applied the instant the wires are connected.

OUR London namesake states that electricity is reported to have proven an effective remedy for frost-bite. Circulation is set up and continues for a considerable time after current has been passed between poles applied to opposite sides of the affected member, but several applications may be necessary to complete the restorative process.

A DISPATCH from Alliance, O., states that a messenger boy for the Postal Telegraph Company in that city has invented an apparatus which can be attached to the telegraph key and will act as a caller. It works automatically and when placed against the instrument will call another office, signing call regularly.

A FIVE story automobile depot is to be built in Boston. When completed it will be a finely equipped building with 5,500 square feet of space on each floor, and every convenience for the accommodation of patrons—ladies' waiting room, reading and lounging rooms, baths, etc.—will be provided. The second and third floors will be divided into offices for manufacturers' agents, and an effort will be made to rent club suites on the upper floors and provide storage for members' machines.

THE Baudot Multiplex Type-Printing Telegraph, a French invention, is doing the whole telegraph business between Berlin and Paris, which heretofore required five telegraph lines, easily over one wire. Consul-General Guenther, of Frankfurt, says that the operation is perfect, and uninfluenced by minor interruptions of the conduit. The work for the operators is not more arduous than with the Hughes apparatus. The new system is not suitable, however, to long cables. "The new successes in quick and multiplex telegraphy will create a peculiar situation for the administration of the telegraphic service," says Mr. Guenther. "If the Baudot system be introduced all over Germany and in addition if the quick telegraph of Pollak and Virag be utilized for newspaper telegrams, and if Prof. Slaby succeeds in applying his discoveries concerning multiplex spark telegraphy to ordinary wires, then it will be only a question of a short time when the existing telegraph business will hardly keep all the lines busy."

AN electric trolley line is being built to connect Chamouni at the foot of Mont Blanc with Geneva, which will enable persons traveling in Europe this summer to reach the beautiful mountain region at a moderate cost, doing away with the expensive luxury of a carriage. Reporting upon this matter to the State Department, Consul Washington, at Geneva, says: "The line has been built at great expense by the Paris, Lyons, and Mediterranean Company from Fayet-St. Gervais, a station two hours by rail from Geneva and a trifle longer from Aix-les-Bains. During the

summer season it is intended to operate six trains daily between Geneva and Chamouni, the time of the run being, according to train, three and one-half to four hours. The line is expected to be in operation by June or July at the latest.

MR. WALTER H. CHAMBERLIN, of Chicago, on Friday tendered his resignation as United States Assistant Commissioner of Patents.

ADVICES from London state that the British Post Office is purchasing a large amount of telephone apparatus from concerns in the United States, one company alone having recently received an order for \$500,000 worth of appliances.

THE United States Civil Service Commission will hold examinations on May 7 and 8 in the Post Office Building, Albany, N. Y. Among the other positions is that of inspector of mechanical and electrical engineering. Information in regard to the subjects for examination may be had from W. J. Guernsey, superintendent of railway mail service.

THE New York Electrical Society will hold its next meeting at Havemeyer Hall, Columbia University, Thursday, April 25, when Mr. C. F. Scott, chief electrician of the Westinghouse Electric and Manufacturing Company, will lecture on "Alternating Current Motors."

THE "Figaro" of Paris states that the Metropolitan Railway has beaten the world's record for the number of passengers carried on any line. From January 1 to March 31 it transported 11,315,799 persons, which at the same rate for a year would give a total of 32,000,000, an average of 4,000,000 per kilometer. It carried on Easter Sunday 182,216 passengers, which number was double the biggest day's total during the Exposition.

THE latest great application of natural force to a useful purpose, in which it is announced that Nikola Tesla is especially interested, is an electrical process for purifying water, says the Baltimore "Herald." The system contemplates, it must be understood, not the shaking of a few millions of unhealthy microbes out of a few gallons of water. Mr. Tesla deals in no such small schemes as that. The plan, when made to work, will be expected to purify the inflow of the open rivers that contribute to the supply of large cities. Instead of swallowing with every glassful of the murky beverage which flows from the faucet a large percentage of odorous protoplasmic germs, the electrified water of Mr. Tesla may be expected to possess the sparkle and sweetness of the aqueous fluid that flows from the mountain rocks. He could confer no greater boon upon humanity. Let us hope this time for practical results.

So many rumors have been current in England respecting the formation of a syndicate in connection with Edison, to work his new ore milling process in order to enable European manufacturers to compete with the United States Steel Company, that the chairman of the syndicate, Mr. J. Lawrence of London, has made public the facts relative to its objects. He says: "The Edison Ore Milling Syndicate consists of 55 gentlemen connected with the iron, steel, machinery, engineering, mining

and banking interests of England. A number of these gentlemen became interested about three years ago in Edison's plan of crushing and treating low grade ores upon which he has expended about \$2,500,000. Satisfied that a prima facie case had been made out in favor of the process, a process which, if one-half that Edison claimed for it was realizable, an industrial revolution of far reaching importance would follow, 33 gentlemen subscribed funds to further investigate the invention, and at the same time search was made for ore deposits workable under the new process. The result of all this has been the formation of the syndicate in question and its control of vast deposits of low grade iron ore in Norway. We are now enabled to produce from two tons of the low grade ore, one ton of high grade Bessemer ore averaging 65 per cent. of metallic iron. We have proved on a portion of this property the existence of 80,000,000 tons of ore with the prospect that other parts of the property may turn out proportionately good. It is our intention at present to erect works and ship the ore exclusively to British iron masters. There is now a promise of a supply of high grade Bessemer ore adequate to the needs of Great Britain for years to come."

WHEN an induction motor is started a resistance is inserted in the rotor and gradually switched out as the motor gains speed, the rotor being finally short-circuited at full speed. The idea of performing the short-circuiting automatically, says the "Elektrotechnische Rundschau," has been put into effect by the Allgemeine Elektrizitäts Gesellschaft by means of a switch fixed on the motor shaft and actuated by centrifugal force.

THE Metropolitan Street Railway Company has removed the compressed air cars from its cross town lines and has gone back to animal power. It is to be hoped this is the last of the air cars. Finis coronat opus.

A DISPATCH has been received by Gen. Greely, chief signal officer, from Col. Allen, saying that the cable ship Burnside has returned to Manila. She has been in the southern islands for several months laying cables to connect the islands of that portion of the archipelago. The Burnside will receive the supply of cable that has been sent to Manila and will again go south to continue the cable laying.

THE Stanley Electric Manufacturing Company of Pittsfield, Mass., will make a large exhibit at the Pan-American Exposition at Buffalo, consisting of generators, switchboard apparatus, instruments, transformers, etc. The whole value of the outfit will be about \$50,000. The most notable exhibit will be a 1,300 hp. generator valued at about \$15,000.

EXPERIMENTS are still being made in Boston Harbor with Prof. Elisha Gray's invention for signaling under water, which was described in the issue of ELECTRICITY of January 16, 1901. The first practical application of the system will it is understood be made at the mouth of the St. Lawrence River where a bell will be attached to a buoy which will inform vessels equipped with the necessary receiving apparatus of their whereabouts.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 23.

THE TELEPHONE AND TELEPHONE PRACTICE.

(Continued.)

The attention of the telephone engineers at present is taken up with common battery or, what is often called, centralized energy systems. In the previous articles on telephony we described instruments and apparatus which depended for their operation on a local battery at each instrument and familiarly known as the general system. Although the general system is yet extensively used, very little attention is being given to improvement in that line, for on account of the advantages of the common battery method practically all the engineers have applied their attention to it, and as a result great strides are being made in the development and improvement of it.

By the operation of a telephone system with its source of energy located at one central point great advantages are derived; for instance, the expense of maintenance is reduced, and there must necessarily be an equalization of efficiency in transmission and the apparatus required at the sub-stations may be much simpler and more effective besides requiring less mechanism and therefore less disorder.

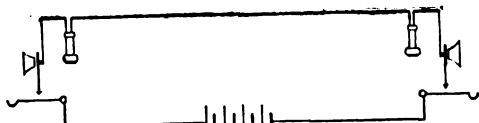


FIG. 1.

The first attempt in the operation of telephones with a battery supply at the central station was by placing a set of batteries in series with each of the operating cord circuits. This circuit (Fig. 1) was a result of some of the first experiments. A low resistance receiver, and also the granular carbon transmitter of the general system type, with slight changes, was used. The result was far from being satisfactory, however, and a flat and unnatural sound was produced, far from the perfect transmission then secured by the induction coil and local battery. You will notice the principle, which is simply a variation in the resistance of the entire circuit by the action of the transmitters, consequently causing a variation in the amount of flow of current which results in a wavy disturbance in the current corresponding to the sound waves acting on the transmitters.

The next circuit put to the test of practical use was where one set of batteries was used for all cord circuits, and instead of having the batteries in series with the cord circuits they were bridged across and connected to the circuit through retardation coils (see Fig. 2). The principle of operation was simply that a variation in the resistance of one circuit caused a corresponding change in the rate of flow in the other, and through the fact that current was fed to the lines through retardation coils the disturbance was effective regardless of the resistance of the common part of the circuits. Although in operation this was a vast improvement on the first circuit, yet it

was found that without the action of the induction coil being brought into play the transmission could by no means be brought to the perfection secured in the most improved type of local battery "phone." This circuit gave by no means poor results, however, and several large exchanges were built and successfully operated involving this principle, in fact, a number of good operating systems in use today operate on this principle with the aid of slightly improved instruments.

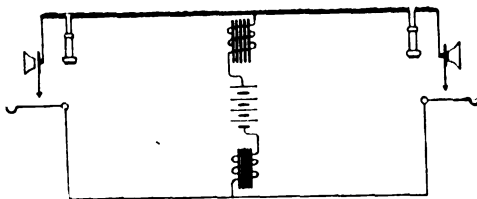
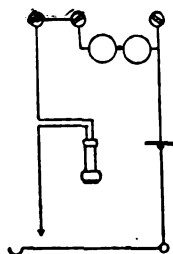
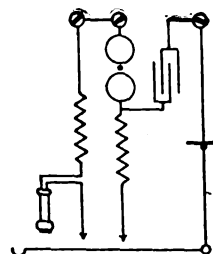


FIG. 2.

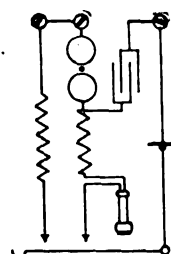
The instrument for use on common battery circuits did not remain untouched, and much changing went on with it as with the circuits and central office arrangements. The first instrument used was simply the receiver and transmitter in series with the line. It was soon found that by the use of an induction coil in the instrument much clearer tones could be secured. The evolution of the instrument is shown in Fig. 3, C being the circuit of the latest type of set.



A.



B.



C.

FIG. 3.

One great disadvantage of using a retardation coil and battery bridged, as in Fig. 2, was that if two lines were connected together, one short and one long, the short line would receive most of the current and the current in the long one would be proportionately diminished.

The next step was to provide so that the current in each circuit would be independent of all other circuits, and to accomplish this a repeating coil was used and arranged as described in Fig. 4. This sketch shows the common battery circuit now used by the Bell Telephone Company. Of course this is the plain circuit with all operating devices and apparatus left out. The common part of all circuits is the batteries and necessary connections including bus-bars, etc. This common part must have practically no resistance. If this were not the case "cross-talk" would exist between the circuits. On account of this storage batteries are almost entirely used, in fact they are necessary in large exchanges anyway where considerable current is required.

Fig. 5 describes a very popular system used extensively by what are known as independent companies. The principle is practically the same as that described by Fig. 3 except two sets of batteries are used and the circuits are not united except by the use of condensers. This overcomes the objection of a short line taking most of the current when connected to a long one, as would occur in the circuit described by Fig. 2. In this system the retarda-

tion coils are replaced by relays of high impedance which perform the same function and also act as operating signal devices.

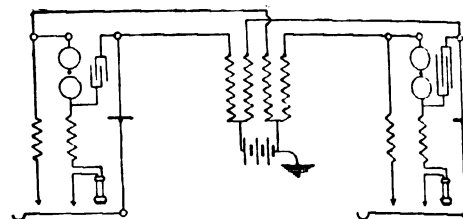


FIG. 4.

The circuits just described are the plain circuits without showing any of the connections, signals and apparatus, essential to their operation in central systems.

The massing of an immense number of subscribers into a central exchange and the providing of a means for successfully and rapidly making any desired connection presents the greatest problem to the engineer, and just at present the operation involves such a tremendous and intricate amount of apparatus that the tendency is very much toward the perfection of it at the sacrifice of efficiency in transmission of sound.

We might hint to the student of an inventive turn of mind, that there is a big field for invention and improvement in the central office systems and a central exchange of large

capacity which will provide simple, effective and rapid means for the interchanging of con-

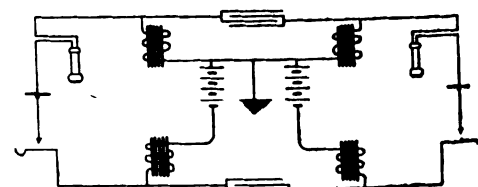


FIG. 5.

nections and still maintain a talking efficiency equal to a direct "un-relayed" and "un-repeated" circuit will fill a great requirement in the telephone field.

Article No. 24 will be entitled "The Telephone and Telephone Practice" (continued).

A Specially-Designed Searchlight for River Navigation.

An English firm has just completed a specially designed electric searchlight, which is about to be shipped to India for use in river navigation at night. The carbons, instead of being vertical are horizontal, and work automatically. It is, however, the facility with which the projector can be moved about that is the chief feature. There are two motors in the base of the instrument, and these, controlled by a special switch, cause the lamp to follow the motions of the hand in all directions in a vertical or horizontal plane.

THE PROPOSED HIGH-SPEED ELECTRICAL "MONO-RAIL" BETWEEN LIVERPOOL AND MANCHESTER.*

BY F. R. BEHR.

Whilst anxious to give you some new and interesting details on the Manchester and Liverpool Electric Express Railway, I approach the subject with great diffidence. There has been so much written and said in connection with this project, that I am afraid you are all familiar with its principal features.

The principle of the mono-rail which it is proposed to use in the construction of this railway is not a new one.

The special form of the mono-rail I have adopted was originally thought of by Mr. Charles Lartigue, a French engineer, who so far applied the idea practically as to construct some primitive and simple lines in Algeria and Tunis in 1883 and 1884 for carrying esparto grass and similar produce, the tractive power being animal in all cases.

As electric traction became more perfected from year to year, I was impressed about the end of 1892 with the fact that an even more important application of this principle was to be found in the construction of high speed railways, to overcome the great and increasing difficulties of managing the various kinds of traffic on the existing railways by removing the express passenger traffic on to new rails.

The absolute impossibility to derail on this system, if properly designed, when going at very high speeds through comparatively sharp curves is its principal recommendation for high speed, as it results in absolute safety and economy in construction. The cost of the mono-rail for average speeds of at least 100 miles an hour would be about the same, or slightly less than the cost of an ordinary two-rail railway constructed for maximum speeds of 60 miles an hour. There is no doubt that ordinary railways could be constructed to work at speeds of 100 miles an hour, if worked electrically, but the additional expense beyond that which is at present necessary would be very great indeed for many reasons, of which the two principal are, the necessity of consolidating the relative position of the two rails in such a way that they would practically form only one, and the impossibility of using curves of a smaller radius than about 3,000 yards, which practically amounts to a straight line, and even with all these precautions the safety obtained could never become so absolute on such lines as it would be on the mono-rail. For instance, one of the principal causes of derailment on an ordinary railway is bad ballasting or packing of sleepers, which results often from heavy rain, floods, or even neglect. The sinking of two consecutive sleepers ever so little in opposite directions must derail the engine on an ordinary line. On the mono-rail such an accident would produce no appreciable effect on the position of the driving wheels and of the carriage as the surface of the top-rail affected thereby is only 2 inches wide, and would therefore produce such a small twist that it would practically not be observable.

There are many causes which contribute to this absolute safety which can only be understood by carefully examining the detailed construction of the carriage as it fits to the permanent way, when it will be observed

amongst other reasons that whereas an ordinary railway carriage is held on the rails by a flange of about $\frac{1}{4}$ th of an inch in depth, the arrangement of this carriage really is equivalent to a continuous flange of over 3 feet in depth, and a feature of great importance to the passenger is that it is not only a very safe way of traveling but it looks also very safe, and produces on the mind of the traveler a feeling of absolute security.

I finally decided to build an experimental line in the neighborhood of Brussels as an annex to the Exhibition of 1897, principally for two reasons: (1) Because the Belgian Government held out great inducements of large financial help. (2) Because I thought that the exhibition would enable a large number of people to visit the line. The chief inducement held out by the Government was the promise of finding the necessary motive power to any extent I might require. I asked for 2,000 hp., which I considered would be amply sufficient. Though the Government agreed to this, the difficulty of finding such power at the exhibition made them finally cut it down to 1,000 hp., and I thought I had better accept this than give up the experiment altogether. No current was furnished to me until the middle of June, 1897, when I obtained a very small portion of the current promised. The electrical station itself was only completed, as far as it ever was, by the middle of July. Practically, therefore, during the exhibition I was deprived of all the advantages which were promised to me. When the current was finally furnished some weeks' running were necessary before a high speed could be attained. The electrical station was so badly arranged, the machines being all of different types, that instead of having regularly available 1,000 hp., I could never rely upon getting more than about 500 hp. Notwithstanding all these drawbacks the experiments were conclusive in establishing the possibility of constructing at a moderate cost lines on the mono-rail principle, to be worked at a speed of double that of existing express trains with absolute safety.

The structure itself consisted of a single rail elevated about 4 feet from the ground, and supported on A-shaped steel trestles. The legs of these trestles were riveted to steel sleepers resting simply on the ballast. These triangular supports were placed about 3 feet 3 inches apart, and at each side were fixed laterally two rails, one about 18 inches above the other. These are the so-called guide-rails, their object being—

1. To brace the whole system together and increase its stability.
2. To engage the horizontal guide wheels of the car and prevent oscillation.
3. To counteract the effect of centrifugal force when rounding the curves.

The electrical conductor was a steel rail fixed on porcelain insulators attached to the sleepers. These rails were joined together by copper strips to preserve the electrical continuity. The return circuit for the electrical current was made through the line itself.

The car was over 60 feet long and 10 feet 10 inches wide.

It consisted of two bogies flexibly coupled together by a specially designed joint.

The part of the carriage below the main rail contained the whole of the mechanism, viz., four electrical motors of about 200 hp. each, suspended from the girders, and connected to

the axles of the driving wheels by specially designed chains.

A rigid iron arm was fixed between the body of the motors and the axles, to which they were coupled. This arrangement made the propelling force absolutely self-contained, so that it could not be affected by any shocks or oscillation that the car might receive.

There were 32 horizontal guide wheels acting on the guide rails for the purposes above described. The whole weight of the car was supported by eight double flanged main wheels, 4½ feet in diameter, the center wheels being driven, the two outer wheels being leading and trailing respectively. The ends of the car were pointed, to diminish the air resistance. The triangular spaces inclosed in these ends were reserved for the driver and conductor. The driver or electrician had under his hand the devices for starting, regulating speed and stopping.

As at a very high rate of speed the ordinary friction brakes might not be efficient, a device was invented by me to utilize the resistance of the air at very high speeds as a brake for slackening the speed so as to bring it within the range of efficiency of an ordinary friction brake.

This arrangement consisted of applying at the front end, outside, vertical louver plates turning on spindles. These presented a large resistance to the air when opened, which increased with the speed of the train, and they could be manipulated at will by the driver.

The interior of the car had sitting accommodation for 100 passengers. Each person had a separate seat, specially arranged so as to avoid discomfort while passing round the sharp curves at high speed.

The electrical current was picked up by trolleys attached to the car, but insulated from the bottom of the bogies.

Owing to the imperfect condition of the generating station, the great weight of the carriage and the difficulties of the line itself, the maximum speed obtained during August, September and October (the only months when the car was running during the exhibition) did not exceed 70 miles in the curves. Still, this result was not unsatisfactory, as to run with absolute safety through curves of 540 yards radius at a speed of 70 miles an hour for three months has never been done before, and this speed could be without difficulty largely increased, certainly to over 100 miles per hour, by increasing the power, or diminishing the weight, or having more favorable gradients. It was only in the beginning of February, 1898, that I was authorized to reconstruct the electrical station, and this was immediately begun, and the whole of the machinery put into working order, while the machine gallery was re-erected. During that time I also came to the conclusion that by removing the top of my carriage and lightening it, more advantageous results might be obtained, notwithstanding the defective electrical station and the difficulties of the line. For that purpose I had a new top to my carriage constructed in Belgium, so that, when completed, the old car with the new top weighed only about 59 tons, instead of 70. This was only completed by the beginning of April, 1898, and from that time until June 11th the Belgium Government Commission, as well as the Commissions of the Russian and French Governments paid many visits to the line, and carried out many experiments jointly with myself. Every possible measurement was taken,

*Abstract of paper read before the Society of Arts, London, Eng., March 13, 1901.

the car was run with half the guide wheels off at the maximum speed, and the car itself was even divided into two parts and one-half run at a time.

The tests applied were of every possible character, and the result was the line was found satisfactory in every respect, and capable of withstanding any pressure required, and showing the greatest stability. A speed was recorded at the rate of 83 miles an hour on the curves of 540 yards radius, a result considerably greater than had been attained previously, and probably higher speeds were occasionally attained. Traveling at that speed was extremely pleasant, and there was a feeling of perfect safety. The absence of vibration was marked, and no accident of the slightest kind happened during the whole of the experiments, notwithstanding the many thousands of people who came to see the line. The main results of the trial were that, given a proper line of sufficient extent to acquire the proper speed, and a properly constructed electrical station, very high speeds up to 120 to 130 miles an hour can be attained with absolute safety and moderate expense, so that lightning express railways can be built of the form which I designed to run at a speed exceeding considerably 100 miles an hour over the same curves and gradients in use on all ordinary main lines in England with absolute safety, as it is impossible to derail or to interfere with the stability of the line.

As the conditions of the proposed line between Manchester and Liverpool will practically do away with all the difficulties and drawbacks of the Brussels experimental line, it will be easy to attain the proposed speed of 110 miles an hour at a moderate cost on that line. The gradients will be easy and suitable for high speeds, the curves will not exceed 750 yards radius, the electrical station will be constructed with the very best and modern machinery, and with ample power.

The train will consist of one carriage, containing 60 or 90 passengers. The trains will start every 19 minutes from either end and will perform the journey in 20 minutes. The electrical station will be situated exactly half way at Warrington, and will have a capacity of about 7,500 hp.

The full speed of 110 miles will be attained within 1½ miles from the start by an acceleration of 1.5 feet per second.

The carrying capacity of the rolling stock, if only the smaller carriage is used, will be 12,000 passengers per day, viz., 6,000 in each direction, and with the larger carriage this can be increased to 18,000 per day.

I should also like to mention here a few words with regard to the absolute safety from collisions on the line, or of accidents of any kind such as one can foresee, and on the proposed system of signals and breaks to insure that safety.

The question of breaks and signals is so intimately connected that the one cannot be treated separately from the other.

Experiments by many eminent engineers have shown that with the Westinghouse brake it is possible to apply a retarding force of 3 miles per second. That is to say, that the speed of a train traveling 60 miles per hour can be reduced each second by 3 miles, and, therefore, it can be brought to a stop in 20 seconds. During this period the train will traverse a distance of about 300 yards. A train traveling at 30 miles per hour can be stopped in 10 seconds, during which time it will have traversed

a distance of about 73 yards. These actual experiences, therefore, show that, with the Westinghouse brake alone, it will probably be possible to stop a train traveling 110 miles per hour in 37 seconds, during which time it will have traveled 995 yards.

It is proposed to equip the new railway not only with the Westinghouse brake but also with an electric brake. This consists of one or two small dynamos which are connected for that purpose with the driving wheels. Where as in ordinary running the current from the generating station is used to rotate the motors, and thus produce speed, by connecting the driving wheels with the dynamos after the current from the generating station is cut off, the rotation of these wheels is utilized to drive the dynamos and to manufacture electricity, which is absorbed by resistances provided for that purpose. This effect can also be produced by short circuiting or reversing the motors, converting them thereby into dynamos.

Let me here remark that this does not in the least resemble reversing the engines on an ordinary steam locomotive. There is no question of stopping the driving wheels so as to make them slide or skid along the rails, but their rotation is used to produce electrical energy, and by absorbing this energy in the wheels create a strong magnetic field, retarding the train.

The power required to stop the train in 500 yards is about 84 hp., or 197 lbs. per square inch on the area of the break disk.

The main advantage of this electrical brake is that it is most effective at the very highest speeds, as of course, a high speed is more effective for generating electrical energy than a slow speed.

With the utilization, therefore, of both the electric brake and the Westinghouse, it is a matter of mathematical certainty that it will be perfectly possible to exercise a retarding force amply sufficient to bring the train to a standstill, from a speed of 110 miles per hour in a distance of about 500 yards, instead of 995 yards as above stated.

I do not wish to suggest that this is a rate of retardation I should desire to use except in dire emergency (which, however, I will show hereafter to be almost impossible to arise), as though it might not injure the passengers it would certainly be uncomfortable.

I only say that by the brakes proposed to be supplied it would certainly be possible upon an emergency (however improbable) to stop the train within the space mentioned.

It is, of course, evident that the most perfect condition under which a railway could be worked would be that in which both brakes and signals could be dispensed with; therefore it follows that the fewer the occasions for using either the better.

Now, in the ordinary way of working our existing railways there are many occasions in which it might be important to stop the train as rapidly as possible; for instance, if a train should be seen in front, or some shunting operations were not completed, or other causes too many to enumerate. But no brake, however powerful, is of the slightest use to-day to avoid a sudden obstacle, such as a stone placed on the rail, or a broken rail, as it is impossible for the driver to be aware of such obstacles until he is very close to them, or practically upon them. For these cases, therefore, the stoppage of 300 yards, or 200 yards, or even 100 yards, is quite useless.

What I wish to show now is, that on the proposed high-speed electrical railway, though it is quite possible to brake the train within 500 yards, it never can be necessary to bring it to a standstill in such a short distance.

On the proposed railway there are no level crossings, no switches, no shunting operations, and, in fact, nothing that will require the train to be brought to a standstill, except in the event of one train preceding another breaking down. Therefore, by clearly explaining the method of signaling the position of each train in relation to the other, the necessity for applying the brakes and the distance in which the trains would have to be stopped in case of a breakdown would be clearly appreciated. Beyond this the brakes need only be used for stopping as you approach the stations.

I now, therefore, have only to explain the manner in which it is arranged that the driver of each train shall be informed of the possible stoppage of the train in front of him.

We will take the case of the line from Manchester to Liverpool, of a length of 34½ miles. As the distance will be traversed in 20 minutes, and a train is to start every 10 minutes in the ordinary way, when everything goes all right, the train will only leave the station at Manchester when the first has reached Warrington, a distance of 17½ miles.

We will sub-divide the line for the purpose of signaling, say, into five sections of about seven miles each. As trains leave Manchester station a danger signal is put up electrically at that station. A second similar danger signal is put up as the train passes point 7 miles, the first remains at danger, and the train travels on; when it reaches 14 miles it puts up a third danger signal, and simultaneously the block is removed at Manchester station, so that the second train can leave when the time comes.

Now we will assume that the first train has met with an accident after passing point 14 miles, the second train would travel at full speed, but when it passes point 7 miles, the danger signal at that point not having been removed by the first train, as this never reached point 21 miles, the driver of the second train would be informed that the first train had met with an accident beyond point 14 miles, and, therefore, that he had to slow down, but that for such lowering of his speed he had a clear run of over 7 miles.

Therefore there could be no difficulty in any case to stop even without using the brakes by simply cutting off the current.

Whenever the train passes over a point where the danger signal is put up, this danger signal is also reproduced by a very simple and inexpensive contrivance in the cabin of the electrician, so that the conductor may hear it and see it, even if there was a thick fog.

Under these conditions of traveling it seems superfluous to have any emergency brakes, and though we shall be able to stop the trains within 500 yards, no case can be imagined in which it would be useful or necessary to resort to such stoppage.

Of course it is useful to have a powerful Westinghouse brake to stop as rapidly as possible at the station. This can be done easily in 1,000 yards on the level without using the electrical brake at all, and as we have a rise of 24 feet in the last 1,500 yards going into Liverpool and a rise of 46 feet in the last 1,200 yards going into Manchester, the cutting off of the current and the application of an ordinary Westinghouse brake about 1,200 yards from

the station, will stop the train quietly and comfortably at the stations.

In choosing for the first line to be worked at these speeds, the line between Manchester and Liverpool, the same reasons hold good which made Stephenson choose it for the first application of the steam railway. I hope to prove thereby to the great railway companies the advantages they would derive in adopting on all great main lines this system for the express passenger traffic alone, thereby solving the problem of increased speed with absolute punctuality, and punctuality not only for the express trains, but also for the working of their enormous traffic on their present rails, consisting of an ever increasing local passenger and goods traffic, which often so blocks the existing railways as to render their safe and punctual working absolutely impossible.

DIRECT-CURRENT GENERATORS.*

BY SIDNEY H. SHORT.*

Some months ago I received through Dr. Hopkinson your kind invitation to read a paper before this society. The letter expressed a desire that the paper be of a character to induce discussion by the members present. I have therefore selected the subject "Direct Current Generators," with the view to considering the feasibility of more nearly standardizing this class of electrical machinery. You will pardon me if I call to mind some well-known facts with reference to the construction and operation of dynamo-electric machines, which I find it necessary to do in order that I may indicate the changes which are taking place in the design of these machines, and to foreshadow the probable modifications which will produce better results in the future. We are all familiar with the original types, the first of which were made just 50 years ago. The pioneer designers produced dynamos which differed widely in the arrangement of their several parts as well as in the construction of the armatures and field magnets. Clark, who was the first to put into execution Faraday's great discovery of induction, used permanent magnets for the field, and an armature core provided with projections, each projection being wound with a coil of insulated wire, the ends of which were connected to commutator bars in the usual way. Gramme, on the other hand, used a ring of soft iron wire for an armature core, the coils of insulated wire being wound spirally around the section of the ring with branches at intervals leading to the commutator. This form is known as the Gramme ring, and for many years was a favorite with generator designers, but is fast going out of use. Early in the history of dynamo construction, Siemens devised the well-known drum winding, the coils of insulated wire being wound lengthwise and over the ends of a cylindrical armature core, with their terminals joined to the commutator strips. This winding in an improved form is now coming into general use, and promises to be the final one. All of the earlier machines were bipolar, with their armatures revolving at a high rate of speed between the two poles of a single U-shaped magnet. They were mostly belt-driven, especially in America, and to some extent in this country, but here the direct-driven high-speed generator made its first ap-

pearance in commercial form owing to the splendid engines available.

When the commercial value of the dynamo became apparent as a source of power for electric lighting, for operating motors, and for the many uses to which large electric currents are put, there sprang up a demand for machines of larger and larger capacity. The two-pole machines were increased in capacity until a limit of distortion was reached, where it was found impractical to further augment their dimensions. The next step, therefore, was the adoption of the multipolar type. In these machines there are two or more magnetic circuits formed in the same core by arranging two or more pairs of field magnets around the periphery of the armature. You are familiar with the advantages of this type of machine. A four-pole machine containing the same quantity of active material as two bipolar dynamos will have their combined output at half their speed. The ease with which these machines can be ventilated, owing to the large internal diameter of the armature, makes them run much cooler than the bipolar type. The arrangement of a number of sets of brushes around the periphery of the commutator permits the use of very short bars, rendering the mechanical construction most perfect. As direct-driven slow-speed generators having many poles are usually specified for our modern power stations, you will be interested in the details of their construction. The magnet frame is a ring of large diameter, usually with a rectangular section, having two feet or brackets cast integral with it, to support it in a vertical plane upon a masonry foundation. The width of the face and the cross-section of this frame do not differ very greatly in machines of different speeds and capacities, except for the very small ones, but the diameter depends on the capacity and number of poles. Some makers prefer to cast this frame in iron, others in steel; each have their advantages and disadvantages. On the whole, I prefer the cast-iron frame, because, while it is nearly twice as heavy as the steel one, it is more rigid and costs less. However, when very large machines are required to be shipped to great distances, it is necessary to use the steel castings, because of the smaller weight. The frame is always divided into two half rings, with finished joints, where they are bolted together. This division is usually on the horizontal plane, but one or two makers divide the ring vertically. On the inner periphery of the magnet frame at intervals are fastened an even number of pole-pieces, projecting radially towards the center. These pole pieces, are always made of good soft steel, sometimes rectangular in section and sometimes round. The area of the cross-section is about equal to that of a cast-iron yoke, but considerably greater than that of a steel yoke. The radial length of these poles, which does not vary greatly with the capacity of the machine, is from 12 to 15 inches. When the frame is made of cast-iron, these pole-pieces are composed of steel plates riveted together to make a nearly square section, and cast into the ring in the proper positions. If the frame is made of cast steel this method of attaching the poles cannot be advantageously used, but they must be bolted to finished surfaces, prepared for them, on the inner surface of the magnet ring, which is a much more expensive process. I must not neglect to explain, however, that when the pole-pieces are bolted to the steel frame they

may be cast in steel, with a round section, and provided with a suitable pole-shoe to fit the armature face, while with the laminated pole the shoe must be fitted to its inner end. On the whole, however, the laminated pole cast in the frame is cheapest, and lends itself to ease of manufacture. The pole-pieces are provided with spools, upon which are wound the magnet coils. These coils are connected in series, and the exciting current traversing them produces alternate positive and negative poles at their free ends.

This completes the essential parts of the stationary portion or field magnet of a multipolar generator. We will next turn our attention to the construction of the armature, with its commutator, which we will find more intricate. The engine shaft carries, besides its flywheel, a massive cast-iron armature hub, keyed to it securely. This hub is provided at its periphery with a flange bolted to the flywheel, thus relieving the shaft and keys from the torsional strain due to the interchange of energy between them. The armature hub is provided with a number of radiating arms, the ends of which are dovetailed parallel with the shaft for a length equal to the width of the pole-pieces. Into these dovetailed grooves are fitted the key pieces formed on the inner edges of the armature laminations. The laminations which form the magnetic portion of the armature ring are made from thin sheet steel of the softest quality. They are in the form of segments of a circle with notches in the outer edges. These segments are built on to the ends of the spokes of the armature hub, lapping joints, until a complete rim or core is formed equal to the width of the pole-faces. Occasional radial ducts are left so that the air may circulate freely through the core to carry away the heat produced by hysteresis and eddy currents. This mass of thin sheet segments is clamped firmly between two end rings of cast-iron, held together by bolts passing between them just inside the lamination. The notches in the edges of the sheets register perfectly, so that slots are formed across the face of the armature to receive the armature windings. An extension of the armature hub carries the commutator support, which is much like an ordinary spoked pulley. At each end of its face clamping rings are provided to secure the commutator bars. These strips are hard-drawn copper of the best quality, and should have a width at the face of the commutator of at least one-third inch. The mica which separates them should never exceed one-thirty-second of an inch, and must be of a very soft quality, so that it will wear more easily than the copper. The bars are beveled or notched at the ends to receive the mica insulating and clamping rings, which secure them to the face of the hub. The commutator is always smaller in diameter than the armature core. In fact it must not have a peripheral speed of more than 2,500 feet or 2,600 feet per minute. With higher-surface speeds it is difficult to prevent sparking. To each bar at the end nearest to the armature core is riveted and soldered a copper strip, projecting radially to the same diameter as the armature core, where it connects with the ends of the armature coils.

The armature coils are simple in construction. Ribbon copper, usually one-half inch by one-tenth inch, is cut into pieces long enough to make a complete coil. This strip is bent on

* Paper read before the Manchester (Eng.) Section of the Institution of Electrical Engineers, Jan. 29, 1901.

edge in the middle, making the two halves parallel with each other and about one-half inch apart; it is then bent flat wise around a former into a rectangular coil with V-shaped ends, joining the two parallel sides, the angle of the V at one end being formed by the terminals of the coil, which are afterwards soldered to the commutator leads. The coils are carefully taped with combination insulation made from paper, mica and linen webbing. They are saturated with insulating compound and baked before being placed in the armature slots. The coils span a segment of the periphery of the armature core equal to or slightly less than the pitch of one pole, one of the parallel sides being fitted into the bottom of a slot, while the other side occupies the top of another slot; two and sometimes more of these coils are placed side by side in the same slot, but it is not best to multiply the number. These coils overlap each other, making a closed circuit spiral winding around the face of the armature with each turn connected to a commutator bar. After the winding is completed, the coils are held in place by banding wires at intervals across the face of the core. The windings are connected to balancing rings placed conveniently between the armature core and commutator, each ring connecting at points of equal potential, ensuring uniform pressure between all the units making up the multipolar machine. It only remains to provide a support for the brushes which collect the current from the face of the commutator. Four brackets are bolted to the end of the frame, and in these the brush rocker rotates through a limited angle. This rocker carries a brush-holder and set of carbon brushes for each pole-piece. They are carefully insulated from the rocker and from each other, but all the positive brush-holders are connected to one massive ring, and all the negative holders to another. These cross-connecting rings form the terminals of the generator from which the leads pass to the working circuit.

The mechanical construction of direct-current generators has, as you can see, been very well developed, and there remain apparently very few improvements to be made in it. We will, therefore, have to look in other directions for changes which will improve their operation and diminish the cost of their manufacture. Until recently multipolar generators were constructed with a limited number of poles, and to accommodate them to the various speeds and increasing capacities required their proportions were distorted, as in the bipolar machines, with the unfortunate consequences always attendant on poor design. Recent machines are being built with an increasing number of poles, and generators of 1,000 kw. with 14 poles, 1,600 kw. with 16, and 3,000 kw. with 24, are in successful operation with speed ranging from 75 revolutions per minute for the larger size to 90 revolutions for the smaller. It is apparent that modern design is tending to a greater number of magnets in the direct-current generator, and it is interesting to see that, on the other hand, the modern alternating-current machine is being made with fewer and fewer poles. The frequency in modern direct-current generators is about 15 cycles per second, while in alternators for power transmission the frequency is as low as 25 cycles per second. Even in the mechanical construction and general appearance these two classes of machines are approaching each

other with this difference, that for the direct-current the armature must revolve to carry on the process of commutation, while in the alternator the field magnets are made to revolve. How far are these changes in design to be carried, and what are the causes acting to bring them about? Experience has taught us that there are certain mechanical, electrical and magnetic values, which, when strictly adhered to in the design of direct-current generators, produce the best working results.

We will apply the best average working values to a unit dynamo with one pair of poles, and for greater capacities add two or more of these units together in the form of multipolar machines to determine the best relation between speeds and capacities. The capacities of these machines thus made from unit dynamos will be fixed, depending on the capacity of the unit and the number of these units used in its design. The speed of these machines will also be established, as we have in the unit dynamo adopted certain values depending upon speed. I have taken for the unit dynamo a surface speed of 3,300 feet per minute for the armature; for the commutator a peripheral speed of 2,500 feet per minute. The teeth on the face of the armature have a pitch of one inch. The commutator bars (550-volt generator) are .377 inch wide, and the pressure between them is 10 volts. Every inch of the periphery of the armature face carries at full load 500 amperes; 10.3 million magnetic lines pass through the magnetic circuit in this unit dynamo. The density in the poles at full load is fixed at 95,000 lines per square inch, in the air it is 80,000, while in the teeth it reaches 120,000 lines. In the armature core the flux is reduced to 65,000 lines per square inch. A fair average frequency for direct-current generators is 1,600 alternations, or 800 cycles per minute; therefore, this unit must run when made into a bipolar machine 800 revolutions per minute and deliver 137½ kw. The performance of this machine will in every way be good, for the various values taken are those most satisfactory. Without making any changes in the dimensions of the parts or in the electrical and magnetic values, we will put two of these units together in the form of a multipolar generator. There will now be four poles, but they will have the same section and the same magnet spools. The armature will be doubled in circumference, also the slots and armature coils, commutator bars, brushes, brush-holders, and various other parts, all being interchangeable with those of the unit machine. This four-pole machine will deliver 275 kw., and the speed will be 400 revolutions per minute. Applying these unit dynamos in the construction of an eight-pole machine, we find that it runs 200 revolutions per minute and has an output of 550 kw. A 10-pole machine will run 160 revolutions per minute and deliver 687 kw.

The accompanying table gives the speeds, capacities and general dimensions of machines up to 30 poles, and in all of them we have not varied from our original data established for unit dynamo:

UNIT DYNAMO-ELECTRIC MACHINE.

Mechanical Data.

Pole pitch.....	25 in.
Peripheral speed arm.....	3,300 ft.
Tooth space.....	1 in.
Peripheral speed com.....	2,500 ft.
Thickness bar.....	.377 in.
Section pole-piece.....	125 sq. in.
Section yoke.....	150 sq. in.

Magnet Data.

Induction air.....	80,000 L.
teeth.....	120,000 "
armature.....	65,000 "
poles.....	95,000 "
yoke.....	35,000 "

Alternations per min..... = 1,600

Electrical Data.

Kilowatt capacity.....	137
Amperes per inductor.....	125
Volts per bar.....	10
Pressure of machine.....	550 V.

Poles.	R. P. M.	Amperes.	Kilo-watts.	Arm. dia. Ft.	Com. dia. Ft.	Kw. 100 revs.
2	800	250	137½	1.3	1.0	17.2
4	400	500	275	2.7	2.0	68.8
6	267	750	412½	4.0	3.0	154
8	200	1000	550	5.3	4.0	275
10	160	1250	687½	6.7	5.0	430
12	133	1500	825	7.9	6.0	619
14	111	1750	962½	9.2	7.0	844
16	100	2000	1100	10.6	8.0	1,100
18	80	2250	1337½	11.9	9.0	1,375
20	73	2500	1575	13.2	10.0	1,720
22	67	2750	1812½	14.6	10.9	2,070
24	63	3000	2050	15.9	11.9	2,460
26	61	3250	2287½	17.3	12.9	2,890
28	57	3500	2525	18.6	13.9	3,360
30	53	3750	2762½	19.9	14.9	3,820

A study of this table reveals the fact that when we have established certain running values to be used in the construction of multipolar generators, we must let the speed of the machine depend upon the output. In making up this table of speeds, the unit dynamo adopted works out well for capacities up to 1,000 kw. or 1,200 kw. For the larger machines, however, it is possible to load the armature with 600 or even 700 amperes per inch of periphery, thus lowering the number of poles, decreasing the diameter of the armature, and increasing the speed. A considerable variation in speed for a given output may be secured by varying the section of the magnetic circuit of the unit dynamo and the number used; the range through which this change in speed can be made is, however, limited. The advantages of a standard system of design as outlined here will be appreciated by manufacturers as well as by users of electrical apparatus, because of the interchangeability of parts and the certainty of uniformly perfect operation of every machine regardless of capacity. In all sizes of machines the same size pole-piece would be used. The magnet spools would all be interchangeable. The armature coils would all be alike. The brushes, brush-holders, and all the connecting parts would be made after the same patterns. The slots in all the armature laminations would have the same width and depth. These conditions, if existing, would greatly cheapen the cost of manufacturing dynamos, therefore the prices charged the purchaser. The steam engine stands in the way of accomplishing these results. The speeds and capacities of engines have been established by their makers without reference to the best conditions for the successful operations of the generators they are to drive. For the smaller dynamos, as you will see by the table given above, speeds of from 300 to 800 revolutions per minute are permissible and entirely proper, but when the larger capacities are reached the speed must be lowered in order to obtain good performance, especially for traction generators. I hope, therefore, that the builders of engines and the manufacturers of direct-current generators will co-operate in establishing a satisfactory scale of speeds and capacities for steam dynamo sets.

THE OUTHENIN-CHALANDRE ELECTROLYTIC ALKALI PROCESS.*

BY JOHN B. C. KERSHAW,
London.

This process for the production of alkalis and chlorine compounds by the electrolysis of solutions of sodium or potassium chloride is a diaphragm process and is in actual operation at Chèvres, near Geneva, and at Montiers, in France. Other works are being built to operate the same process in Italy and Spain. The English patents protecting the process are dated 1893 and 1896, and are numbered 15,906 and 15,834 respectively. The first relates to the cell design, the second to a modification in the process for improving the impurity of the chlorine evolved from the anode chamber of the cell.

Fig. 1 is a sectional elevation of the cell. The cell consists of an outer vessel K, and of an inner vessel A, entirely closed and built of materials unacted upon by chlorine gas or its compounds. This inner vessel is filled with rows of porous-diaphragm tubes *o o*, open at each end to the outer chamber, K, of the cell, and inclined at a slight angle, as shown in Fig. 1. Each tube is hermetically sealed into the walls of the chamber A by a special device shown at Z, and contains an iron sheet cathode running the whole length of its interior. These sheet cathodes join to a common terminal at M, and each vertical row of diaphragm tubes is thus served with current by the one electrical contact to the mains' supply. The anodes, I, are round rods of specially prepared carbon, fixed into the common lead head-piece U, and communicating at *e* with the negative terminal of the dynamo.

They hang vertically in rows of seven between the rows of diaphragm tubes, and the chlorine evolved at their surface collects in the upper portion of the anode chamber, and is carried away by the outlet pipe H. The right-hand side of the inner cell is provided with a sheet iron movable hood, V, and outlet pipe not shown in Fig. 1. This serves to collect and carry away the hydrogen liberated within the diaphragm tubes and facilitates its utilization for other purposes.

The cell is operated in the following manner: The inner chamber A is nearly filled with a concentrated solution of sodium hydrate. The electrical connections are then made. The chlorine gas liberated within the chamber A passes off by the pipe H, and is used for the manufacture of bleaching powder or for some other purpose. The sodium liberated at the surface of the sheet-iron cathodes decomposes the water present, yielding hydrogen gas and a solution of sodium hydrate. The first travels up the tubes, and escapes into the collecting chamber V, whence it passes to a gas-holder for storage until required. The solution of sodium hydrate, owing to its higher specific gravity than the surrounding solution, travels down the tubes, and collects on the bottom of the outer chamber of the cell. Since the cell design permits the hydrogen to pass away with a minimum disturbance of the electrolyte in this outer chamber, fairly concentrated solutions of sodium hydrate can be obtained, and when required are run off by the outlet pipe *v*.

The advantages claimed for this type of cell are: Complete separation of the electrolyte in

the anodic and cathodic compartments of the cell, with consequent prevention of hypochlorite and chlorate formation; collection and utilization of the hydrogen liberated at the cathodes. The disadvantages would appear to

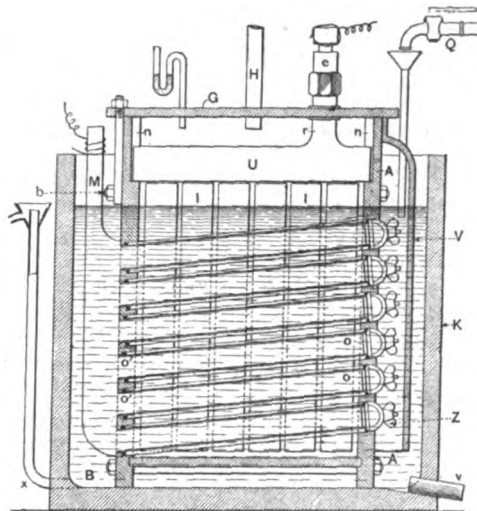


FIG. 1.

Sectional Elevation of the Outhenin-Chalandre Type of Cell.

be a high emf. due to the diaphragms, and a very complicated structure, with consequent high cost for maintenance and repairs. That the cell has been operating at Chèvres since

acid present in excess of that required for the above decomposition shares in the electrolysis with production of Cl at the anode and H at the cathode.

The writer is informed that this modified process is in operation at Chèvres. It is obvious, however, that the chlorine liberated by direct electrolysis of hydrochloric acid is only gained by a double expenditure of electrical energy; for each atom of chlorine obtained in this way has first been separated by electrolysis of sodium chloride. The gain in purity of the chlorine liberated in the anode chamber of the cell is therefore purchased by an increase in the kilowatt hours per ton of chlorine produced, and the advantage is a doubtful one. Until figures have been published showing the yield of the Outhenin-Chalandre cell under actual working conditions, comparison of its efficiency with that of the Castner and Hargreaves-Bird cell is impossible.

The works at Chèvres are operated by power from the Geneva municipal generating station on the Rhine. The power is transmitted by air lines a short distance to the electrolytic works, and is used to operate a 1,200 hp. Thury motor generator and a 500 hp. Brown-Boveri motor generator, both giving direct current. Fig. 2 is a river-side view of the electrolytic alkali works. A portion of the chlorine produced in this works is used in the manufacture of pure chemicals for laboratory

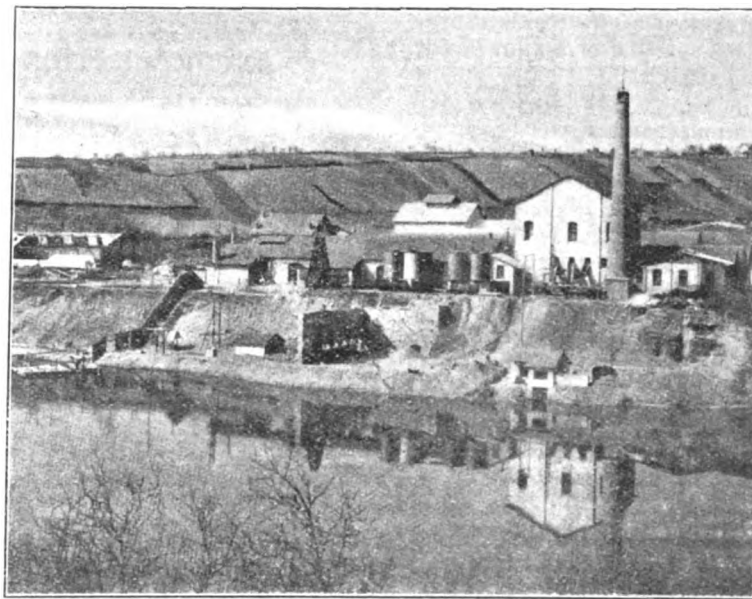


FIG. 2.—THE ELECTROLYTIC ALKALI WORKS AT CHEVRES, SWITZERLAND.

1899 with presumably satisfactory results (for other works to operate the same process have since been planned) is proof that under certain conditions the advantages outweigh the disadvantages named above. The cell, however, cannot be considered a complete success, for oxygen and oxygen compounds are liberated with the chlorine at the anode, and it is in order to suppress these that the process has been modified in accordance with the details given in patent No. 15,834 of 1896. The hydrogen liberated at the cathodes is collected and burned in a special form of burner in an atmosphere of chlorine, and the hydrochloric acid which results from this combustion is fed into the anode chamber of the cell. Should ClO compounds be present these are decomposed with production of H₂O and Cl₂. The hydrochloric

and medical purposes. Liquefied chlorine is also one of the products of the works.

The greater portion is, however, used in the production of bleaching powder. As regards soda products, caustic lyes and solid caustic soda are manufactured to suit the requirements of the firm's customers. At the Paris 1900 Exhibition a block of solid caustic soda was exhibited by this firm, testing 75.6 per cent. Na₂O, equal to 97.6 per cent. NaOH. This shows that only comparatively small amounts of sodium chloride and other impurities find their way into the cathode compartment of the cell. The works at Chèvres are owned by the "Société Anonyme Suisse de l'Industrie Electro-Chimique Volta," a company which also owns and operates the carbide works at Ve-niers.

*From the "Electrician," London.

THE INSTITUTE'S CONVERSAZIONE.

The American Institute of Electrical Engineers held on Friday evening, April 12, its "conversazione," at Columbia University. There was a most attractive display of electrical apparatus and inventions of every description. Nikola Tesla exhibited his oscillator while Peter Cooper Hewitt's invention for lighting by means of incandescent gas was also in evidence.

In a room near the Hewitt lights were the akouphone and akoulalion invented by M. R. Hutchinson, and described recently in *ELECTRICITY*. They are microtelephonic instruments, so constructed as to reproduce and intensify sounds and still preserve their quality.

To show how the instruments worked there had been brought to the conversazione from the New York Institute for the Deaf about a dozen young men. Head instructor William H. Van Tassel was in charge of them and announced that they were the deafest of all the scholars in the institution. One of them, Oris Benson, was both deaf and blind. He cannot hear a gun shot off within a yard of his head, only perceiving the vibration of air caused thereby. It was his performance with the help of the akouphone that interested the spectators. Altogether he has never had but five hours of instruction in talking. His vocabulary is limited to a little more than a dozen words.

When Mr. Van Tassel spoke to him over the instrument, it was wonderful to see the expression of delight that spread over his previously sad face, the smile that came seeming almost to reach to the very edges of his sightless, dull eyes. In a hollow, mechanical voice he repeated the things he heard in the receiver of the akouphone. He said "bad boy," "papa," and several short words. Then a gramophone was attached to the instrument and he listened to a gay march, smiling and beating time on the table with his fingers.

H. R. Palmer's "fac simile picture telegraph" was one of the exhibits. This instrument is worked on a system whereby half-tone pictures, sketches, handwriting, and the like can be transmitted over long distances by employing ordinary telegraph circuits. The original picture is enlarged for transmission, but is photographically reduced to its normal size when received. The enlargement is for the purpose of obtaining a greater contact surface for the transmitting stylus.

A practical appliance, and one that everybody could understand the workings of, was the telepherage carrier, for the transportation of freight in small bulk. Above the carrier, which is a diminutive car, there runs a cable that obtains a current by contact with a lighter wire above. Along this supporting charged cable the car is made to speed at a lightning rate by the aid of a motor. The vehicle will be used for transferring packages from ship to shore, from tunnel to surface, and so on.

Dr. Francis B. Crocker, Professor of Electrical Engineering at Columbia University, had on view his appliance for showing the magnetic properties of liquids and their permeability. An elaborate display of Dr. M. I. Pupin's long-distance ocean telephony was to be seen in model form.

Wallemar Paulsen's telephonograph and telegraphone was examined by those present with much enthusiasm. It is an intricate appliance, to be used for sending a telephone

message to a person who is away from home. The message is recorded automatically, and when the person returns, he or she has but to press a button to hear the message repeated.

In all there were thirty-two exhibits. The guests numbered several hundred, among them being Thomas A. Edison, Nikola Tesla and other famous electrical engineers and scientists.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended April 3:

Antwerp, 11 cases, \$1,012; Berlin, 25 packages, \$3,600; Brazil, 21 packages, \$2,656; British East Indies, 261 cases, \$1,275; British Guiana, 61 packages, \$5,128; British West Indies, 12 packages, \$522; Central America, 12 packages, \$684; Chili, 1 package, \$19; Cuba, 84 cases, \$1,240; Dutch West Indies, 1 package, \$12; Ecuador, 1 case, \$27; Genoa, 79 packages, \$18,970; Hamburg, 18 packages, \$608; 6 cases motor vehicles, \$1,800; Havre, 194 packages, \$23,853; Hayti, 2 packages, \$51; Liverpool, 96 packages, \$9,801; London, 181 packages, \$12,498; 21 packages motor vehicles and parts, \$14,000; Manchester, 41 cases, \$10,365; Mexico, 64 packages, \$2,583; Moscow, 6 cases, \$420; Newcastle, 1 case, \$200; Oporto, 3 cases, \$196; Peru, 21 packages, \$1,925; Santo Domingo, 12 packages, \$160; Southampton, 37 packages, \$3,322; 1 case motor vehicles and parts, \$117; U. S. Colombia, 29 packages, \$235.

INCORPORATIONS.

The Citizens' Electric Light & Power Company, Columbus, O. Capital stock, \$50,000. Incorporators: C. A. Neff, C. H. Kilby, L. Q. Rawson and S. C. Pasco of North Amherst.

The Au Sable Electric Light & Power Company, Au Sable Forks, N. Y. Capital stock, \$25,000. Directors: James Rogers, George Chahoon and J. Monroe Sheffield, all of Au Sable Forks.

The International Electric Company, Trenton, N. J.—to build and operate plants for the purpose of furnishing electric light, heat and power. Capital stock, \$3,000,000. Incorporators: Adrian H. Miller, Charles M. Kling and Stephen C. Smith.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED APRIL 9, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

671,488. Trolley Finder for Electrical Railroads. Paul Goldsmith, Troy, N. Y. Filed Aug. 16, 1900.

671,445. Door for Trolley-Car Barns. William R. Kinnear, Columbus, O. Filed Nov. 7, 1900.

671,482. Electric-Railway System. Paul E. Herkner, Berlin, Germany. Filed Nov. 30, 1900.

671,491. System of Train Control. William B. Potter, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed June 12, 1899.

671,515. Contact-hoe for Electric Railways. George T. Hanchett, Hackensack, N. J., and John M. Murphy, Torrington, Conn., assignors to the Murphy Safety Third Rail Electric Company, New York City. Filed July 27, 1900.

671,866. Electric-Railway System. John M. Murphy, Torrington, Conn., assignor to the Safety Third Rail Electric Company of New York City. Filed Aug. 4, 1898.

ELECTRIC LIGHTS AND APPLIANCES.

671,512. Electric Arc Lamp. Thomas E. Drohan, Chicago, Ill. Filed June 12, 1900.

671,698. Electric-Lamp Receptacle. Wilbert E. McDonald, Chicago, Ill. Filed Sept. 22, 1897.

671,618. Flexible and Adjustable Supporting Device for Electric Lamps. William F. Brewster, New York City. Filed Nov. 30, 1900.

671,819. Flexible Supporting Structure for Electric Lamps. William F. Brewster, New York City. Original application filed Nov. 30, 1900. Divided and this application filed Jan. 23, 1901.

671,725. Heater for Electric Glow-Lamps. Frederick M. Goddard, Pittsburg, Pa., assignor to George Westinghouse, same place. Filed July 20, 1899.

ELECTRICAL MACHINERY AND APPARATUS.

671,490. Controller for Electric Motors. William B. Potter, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Dec. 30, 1897.

671,655. Power Transmitting Mechanism. Fredrick T. Overrocker, Philadelphia, Pa., assignor of one-third to Alonzo W. Allen, same place. Filed Dec. 27, 1900.

671,662. Electric Motor. Henry P. White, Kalamazoo, Mich., assignor of three-fourths to Charles D. Fuller, same place. Filed Oct. 5, 1899.

671,730. Frequency or Speed Indicator. Ralph D. Mershon, New York City, assignor to the Westinghouse Electric & Manufacturing Company of Pennsylvania. Filed July 12, 1899.

671,776. Annunciator. David Rousseau, New York City. Filed July 21, 1899.

671,883. Electric Switch. Francis Head, Philadelphia, Pa. Filed Jan. 28, 1901.

671,907. Controller for Motors. Frederick B. Duncan, Madison, Wis., assignor to the Northern Electrical Manufacturing Company, same place. Filed July 9, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

671,458. Electric Telephone-Receiver. Ernest H. Strauss and Frank J. Stein, Chicago, Ill. Filed Aug. 13, 1900.

671,473. Holder for Telephone-Receivers. Thomas Emerson, Newport, R. I. Filed Sept. 27, 1900.

671,577. Telephone Desk. Charles E. Bartholomew, Hamilton, Can., assignor to John F. Stevenson, same place. Filed July 23, 1900.

MISCELLANEOUS.

671,489. Booster Crusher. Mathias Pfaticher and Charles H. Bedell, Philadelphia, Pa., assignors to the Electro Dynamic Company, same place. Filed Aug. 24, 1900.

671,507. Apparatus for Electrically Treating Gases. Reginald J. Yarnold, Streatham, Eng. Filed Aug. 29, 1899.

671,518. Phonograph. Frederick D'Arrey Gould, Worcester, Mass. Filed Jan. 18, 1899.

671,528. Brake for Spring Motors. Belford G. Royal, London, Eng., assignor to Thomas S. Parvin, Philadelphia, Pa. Filed May 16, 1899.

671,532. Automobile Vehicle. John H. Warren and John A. Hoffman, Cleveland, O. Filed Oct. 15, 1900.

671,569. Electrically-Heated Sad-Iron. John D. Theisz, Newport, Ky. Filed July 30, 1900.

671,575. Motor-Carriage. William J. Woosley, San Francisco, Cal. Filed Aug. 11, 1900.

671,625. Phonograph. Ellsworth A. Hawthorne, Montclair, N. J. Filed Jan. 18, 1900.

671,660. Electrically-Operated Fan. Richard W. Schmelz, Brooklyn, N. Y. Filed Nov. 6, 1900.

671,673. Variable-Speed Reversing-Drive for Automobiles. Whitcomb L. Judson, Chicago, Ill. Filed Nov. 6, 1899.

671,675-671,676. Power-Transmitting Device. Whitcomb L. Judson, Chicago, Ill. Filed April 20, 1900, Aug. 30, 1900.

671,687. Brace for Motors of Self Propelled Vehicles. James H. Bullard, Springfield, Mass., assignor to the Overman Automobile Company, Chicopee, Mass. Filed Aug. 1, 1900.

671,715. System of Electrical Distribution. Charles I. Young, Philadelphia, Pa., assignor to the Westinghouse Electric & Manufacturing Company of Pennsylvania. Filed Aug. 8, 1899.

671,721. Gearing for Automobiles. Frank L. Dyer, Montclair, N. J., assignor of one-fourth to Leonard Huntress Dyer, Washington, D. C. Filed Jan. 6, 1900.

671,732. Wireless-Telegraph System. Harry Shoemaker, Philadelphia, Pa., assignor of one-half to Marie V. Gehring, same place. Filed Oct. 18, 1900.

671,835. Hydraulic Press for Splicing Electrical Conductors. Thomas J. McTighe, New York City. Filed March 20, 1900.

671,856. Truck for Autocarets. John W. Darley, Jr., Baltimore, Md. Filed Sept. 4, 1900.

671,876. Self-Locking Insulators. Willard P. Beardsley, Altoona, Pa. Filed March 19, 1900.

671,891. Electric Toy. Arthur A. Kent, Lebanon, N. H., assignor of one half to Frank B. Kendrick and William F. Davis, same place, and partners under the firm name of Kendrick & Davis. Filed Jan. 29, 1901.

671,916. Electrolytic Water Purifying and Filtering-Apparatus. Charles E. Holland, New York City. Filed Nov. 28, 1900.

Announcement.

The Haines & Noyes Company, manufacturers of guaranteed telephone apparatus for every possible use, announce that they have now consolidated their sales department and factory at 118 132 W. Jackson Boulevard, Chicago, and that they are prepared to fill all orders, large and small, very promptly. The increased space will permit them to manufacture telephone apparatus in large quantities, and they state they will have a large stock on hand at all times. They inform us that they are adding many improvements to their instruments. They will be glad to send their latest bulletins to parties desiring same.

THE TELEPHONE WORLD.

Ohio Telephone Association.

The annual meeting of the Ohio Telephone Association, which was held recently in Columbus, was attended by about 300 representatives of independent telephone companies of the State. Judge J. M. Thomas of Cleveland presided and an interesting programme of papers and discussions was carried out. The association re-elected the following officers: President, Judge J. M. Thomas, Cleveland; first vice president, D. J. Cable, Lima; second vice-president, C. Y. McVey, Youngstown; secretary and treasurer, H. D. Critchfield, Cleveland.

The manner of taxing the companies for funds to carry on the work of the association was discussed and placed in the hands of a special committee, composed of Judge Thomas, Mr. Cable, Hon. Edward Kibler, Newark; Mr. Critchfield, Frank Davis, Columbus; Judge L. D. Hagerty, Columbus, and Hon. Harry M. Daugherty, Columbus. The association voted to pay \$4,000 on the bill of \$25,000 for legal services in the Berliner Telephone patent suit. The manufacturers and operators of plants are to pay \$12,000 of this amount, and Judge Thomas at the meeting at Chicago guaranteed the payment of \$4,000 by the Ohio Association.

Several interesting reports were submitted, among them a report of the Citizens' Telephone Company of Columbus, which showed that it had 4,988 phones in operation, and 390 in course of extension. Henry A. Lanman of the local company and Secretary J. Y. Bassell of the Columbus board of trade delivered the addresses of welcome, which were responded to by Judge Thomas. A vote of thanks was extended to the Citizens' Company for courtesies shown the visitors.

The Iowa Telephone Company is rebuilding with copper metallic circuits a number of its lines in Iowa. A crew is now reconstructing a line between Des Moines and Sioux City by way of Fort Dodge and Boone. The line as far as Fort Dodge has already been fully equipped. From Fort Dodge another copper metallic circuit will be built north through Humboldt and Forest City to Albert Lea, where it will connect with a line into Minneapolis and St. Paul. Other lines will also be constructed. It is claimed for the improvements now under way that when they are completed Des Moines will be able to talk to practically every town of importance in the State direct without repeating messages as is necessary now in order to reach a number of points.

The Rochester, Ind., Telephone Company has purchased the telegraph line along the Cudaby oil pipe line from Roann to San Pierre, a distance of 71 miles. The company will at once rebuild the line and open stations at Disko, Gilead, De-long, Monterey, Bass Lake, North Judson and San Pierre. At Roann connection will be had with the independent long-distance telephone service of Indiana, Ohio and other States. It will also connect with the local telephone systems at Kewanna, Plymouth, Akron, Winamac, North Judson and Knox.

It is announced that the Western Telephone Company will construct a line from Garretson to Dell Rapids, S. D., and that the line will be in operation by the first or the middle of June. The line will run by way of Sherman. It is understood that a number of farmers along the line will have connections made with their homes so that they can talk direct either with Garretson, Dell Rapids or Sioux Falls, saving them many a long and tiresome trip, and making it possible for them to keep posted without "coming to town."

The Home Telephone Company of Buffalo, N. Y., now numbers nearly 500 subscribers, showing a good record for its ten months' existence. Toll service has been in operation with Tonawanda for some weeks and with the prospect of a franchise for Lewiston the extended service will soon double its patronage. Notwithstanding statements to the contrary, the Home Company seems to be gaining a firm foothold.

Direct telephone connection between Brenham and Caldwell, Tex., was established recently by the completion of the Trans-Telephone Company's lines to the latter place. The line will be carried north as far as Milano in that State as soon as possible, and will be extended south from Brenham.

There are some good prospects of a combination being formed between the Chesapeake Telephone & Telegraph Company and the Newport News and Richmond Telephone & Telegraph Company, both of which have central offices at Williamsburg, Va.

J. W. Martin of the People's Telephone Company of Detroit, Mich., states that work on the construction of the plant will begin shortly.

Telephone Companies Unite.

Final steps were taken April 11 in the big telephone consolidation scheme engineered by the syndicate headed by Geo. R. Webb of Baltimore, Md. At the meeting of the directors of the United Telegraph & Telephone Company, the following properties were acquired:

Maryland Telephone & Telegraph Company; capital stock, \$1,000,000.

Pittsburg & Allegheny Telephone Company; capital stock, \$1,500,000.

West Penn Long Distance Telephone Company; capital stock, \$1,000,000.

Home Telephone & Electric Company; capital stock, \$300,000.

Allegheny County Telephone Company; capital stock, \$20,000.

Harford County Telephone Company; capital stock, \$10,000.

In all about 50,000 telephones, either in actual operation or under contract awaiting installation, will go into the combination. The United Company obtains a strong position in the Pittsburg territory by the interests absorbed there.

The Georgia Telephone & Telegraph Company of Savannah has issued a new list of stations, which shows that the company has added 400 subscribers to its list since last October. These additions give the company now slightly over 1,300 subscribers and others are being added daily—in fact, so great is the demand for phones that the company will be forced to add a new cable capable of accommodating 200 instruments. This cable has already been ordered, and it is expected that the work of drawing it in will be begun about May 1.

S. P. Light and W. D. Barnard, directors of the United Telephone & Telegraph Company of Philadelphia, Pa., have bought the Altoona Phoenix Telephone Company. The purchasers will connect the local system with their recent purchases in Montgomery, Chester, Delaware, Lancaster, Lebanon, Northumberland, Montour, Columbia, Union and Lycoming Counties.

Lockhart, Tex., now has regular telephone connection with all the surrounding towns and neighborhoods of Caldwell County. Maxwell, Reedville, Ublaud, Martindale, Mendoza, Lytton Springs, Dale, Tilton, Prairie Lea, Holmes, Fentress, McMahon and Luling are within talking distance of Lockhart.

Arrangements are now about complete for the construction of a telephone line between Laurel and Ellenville, Miss. As soon as this line is in working order lines will be strung to other points, and it will be only a few years until all points in southeast Mississippi will be connected by telephone. Local parties are behind the scheme, and are receiving united support.

L. B. Foley, of New York, superintendent of telegraph for Delaware, Lackawanna & Western, was in Binghamton, N. Y., recently, to make preparations for reorganizing the telephone system in the yards of that city. There are now eleven telephones in operation and it is expected that a number will be added and the system entirely changed.

John Smoulter, a banker of Wilkes-Barre, Pa., has a large financial interest in the new Independent Telephone Company of Seattle, Wash. He says that work will begin at once and that the system will be carried through Washington to Portland and eventually to California.

The New England Telephone Company will shortly begin to set poles and string wires for the establishment of a telephone exchange at Shelburne, Mass.

The West Liberty Telephone Company has been granted the use of the streets and alleys of Muscatine, Ia., to erect its poles.

At a recent meeting of the Idaho Springs, Col., city council the Pasquez Valley Independent Telephone Company made application for a franchise.

Bassett, Neb., is to have telephone connection with Springfield, the county seat of Keya Paha County, and also Carnes in the same county. The line will be about 45 miles long.

The Central Union Telephone Company has received material for a telephone line from Bloomdale to Eagleville, O., and will put in a toll station there.

The Union Telephone Company of Athens, O., has increased its capital stock from \$15,000 to \$30,000.

An Independent Telephone Combine.

Barber & Bailey of Wauseon, O., who in the last few years have established fifteen different independent telephone companies in various parts of Ohio, Indiana and New York, retaining an interest in nearly if not all, are endeavoring to form a combination of the fifteen companies.

The Farmers' Co-Operative Telephone Company has been organized in Clark's Hill, Ind., to meet the rates of the Bell and other companies. Subscribers must pay toll to use the city service of the old companies, while the co-operative company offers free service to all city switchboards operated by it at only 25 and 50 cents a month. As a result many subscribers to the old companies have withdrawn their support.

The long wire fences which many Australian herd owners have been compelled to make to protect their lands from the rabbits are now used to a great extent as telephone conductors which the neighbors communicate with each other. In many cases the distance covered is as great as 14 miles. Although the wires are somewhat defectively insulated, they perform their function in an excellent manner.

The Hinton, W. Va., Consolidated Telephone Company's plant has been sold by the stockholders to satisfy the indebtedness against the company. The property was bought by B. F. Mann, and will be consolidated with the Monroe and Greenbrier system, which owns several hundred miles of lines. This consolidation will connect nine counties in that part of the State and also have connection in Virginia.

The Commercial Telephone Company of Warsaw, Ind., announces that if a sufficient number of subscribers can be obtained it will extend its lines throughout the country and give to the farmers the same service as is given to the city people. The lines will be connected with the city system and the rental rate will be the same as that in Warsaw.

Franchises for telephone lines have lately been granted by the boroughs of Athens, Sayre, South Waverly and Tonawanda, Pa., to an organization of local capitalists. Application for franchises has been made in three other boroughs and in the city of Elmira by the same interests.

The Union linemen employed by the New England Telephone & Telegraph Company as well as the Boston Electric Light Company, have given notice of a strike on May 1 unless they are given an eight-hour day and a raise in wages of 50 cents per day. One thousand men may go out.

It was recently reported on apparently good authority that the Ansonia, Conn., Telephone Company would shortly be absorbed by the Southern New England Telephone Company. It is said that several of the large stockholders of the Ansonia company have already disposed of their holdings to the other corporation.

The wire for the new telephone line between Van Buren and Edmuntston, Me., will soon be laid and later a new line will be built from Van Buren to Caribou in that State, and connect with the New England Telephone Company.

The new telephone line will soon be completed to Buffalo Lithia Springs, Va., which will make connection with a great many of the North Carolina and Virginia cities, also nearly every village.

A report from Minneapolis, Minn., states that the Zenith Telephone Company will increase its funds by an issue of \$100,000 in bonds, which will be used for extensions to the system and for a commencement of the long distance system.

The Northern New York Telephone Company will probably extend its line to Tupper Lake this spring.

The Farina & Vandalla Telephone Company of Farina, Ill., has increased its capital stock from \$2,500 to \$5,000.

TELEPHONE INCORPORATIONS.

The Green's Fork Co-operative Telephone Company of Green's Fork, Ind. Capital stock, \$4,000.

The Enterprise Telephone Company, Elgerton, Minn. Capital stock, \$50,000. Directors: Edward Yocum, William Lockwood, C. G. Brady, C. S. Howard and H. W. Davies.

The Clarendon Telephone Company, Clarendon, Tex. Capital stock, \$3,000. Incorporators: R. W. Talley, John M. Clower, J. D. Stocking and A. M. Beville.

The Interstate Telephone Company, Camden, N. J.—to operate telephone lines. Capital stock, \$100,000. Incorporators: Paul W. Muller, Camden, N. J.; Max Phillips and F. R. Hansell.

GENERAL ELECTRICAL NEWS.

Lighting.

Abbeville, S. C.—The Abbeville Electric Light & Power Company will issue \$10,000 of bonds for improvement purposes. C. G. Sayre, general manager.

Amherstburg, Ont.—The plant of the electric light company was recently destroyed by fire.

Baker City, Ore.—An election will be held April 29 to vote on the question of issuing \$100,000 bonds for the construction of an electric light plant and the improvement of its water system.

Booth Bay Harbor, Me.—The Booth Bay Harbor Light, Heat & Power Company has been organized in this city for the purpose of generating and supplying gas or electricity with \$10,000 capital stock. K. H. Richard is president.

Brazil, Ind.—This city is taking steps to put in and operate its own electric light plant.

Burlingame, Kan.—The citizens of this place are agitating the question of electric lights.

Butler, Mo.—At the recent city election the proposition to issue \$10,000 in bonds to erect an electric plant was carried by an overwhelming majority.

Canton, W. Va.—The electric light power house in this village was burned a short time ago.

Carthage, Ind.—The town council has granted a franchise to Ed. Hill to put in a water and electric light plant.

Cedar Springs, Mich.—J. H. Worden will soon install an electric light plant in his new planing mill.

Clear Lake, S. D.—A local company is being organized to erect an electric light plant.

Clifton, Tenn.—T. S. Hughes and J. G. Russ will establish an electric light plant here.

Daytona, Fla.—A Schantz of Dayton, O., has purchased a site at this place and will erect an electric light plant.

Fairfield, Ia.—The citizens of this place have voted to establish a municipal electric light plant.

Greenwood, Ind.—Greenwood has voted in favor of permitting a company to build an electric light and waterworks plant.

Greenville, Miss.—H. Crittenden and others have organized a \$25,000 company for the establishment of an electric light plant.

Indianapolis, Ind.—The board of works has instructed City Engineer Jeup to prepare specifications for a new electric light contract, and bids will be advertised for shortly.

Lincoln, Neb.—The proposition to permit the city council to issue \$55,000 in bonds to establish and maintain an electric light plant was carried at the recent election.

Manchester, Vt.—An electric light plant will be installed here by J. Marsden, of Utica, N. Y.

Mansfield, O.—An election will be held May 6 to vote on the question of bonding the city for \$65,000 for the establishment of a municipal electric light plant in connection with the sanitary plant now in process of construction here.

Michigan City, Ind.—The Laporte & Michigan City Railway Company is after a franchise for an electric light, heat and power plant in this city.

Minot, N. D.—Minot has granted an electric light franchise to L. M. Davis.

Oskaloosa, Ia.—Among the improvements for this place are an electric railroad, an electric light plant and a heating plant. This alone will cost \$275,000.

Pittsburg, Tex.—The plant of the Pittsburg Ice & Electric Light Company was lately destroyed by fire. The loss is estimated at \$7,000.

Salisbury, N. C.—The gas plant and electric light plant at this place have been purchased and will be remodeled and renovated. The J. B. White Company can be addressed.

Sharpsburg, Pa.—The city council contemplates the issuance of \$30,000 in bonds to improve its electric light plant. An election will be called to vote on the question.

Worcester, Mass.—The Worcester Electric Light Company will ask the city for permission to lay 10 miles of conduits this year. To do the work more than \$200,000 will be spent.

Street Railways.

Baltimore, Md.—The incorporators of the Washington & Annapolis Electric Railway Company are trying to interest Philadelphia capitalists and the Johnson street railway syndicate in a plan to construct a trolley line from Philadelphia to this city.

Canton, O.—The Canton-Akron Electric Railway Company has been incorporated by W. H. Hoover of New Berlin, C. A. Kolp, J. C. Welty and others. The company's capital stock will be \$600,000, and an electric line will be built from here to Akron.

Carrollton, Ky.—The Carrollton, Worthville & Owenton Electric Railroad Company will erect an electric road from Milton to Owenton a distance of 40 miles.

Charleston, S. C.—The Exposition Traction Company of this place, has been granted a franchise and will build a car line from here to the exposition grounds.

Cincinnati, O.—The Cincinnati & Eastern Electric Railway Company, which will build the line to New Richmond, has increased its capital stock from \$10,000 to \$500,000.

Corsicana, Tex.—R. Stanhop, representing St. Louis capitalists, has a plan for building an electric railway here.

Elkin, N. C.—The prospects for building an electric railway from here to Sparta seem to be good.

Findlay, O.—The Toledo & Findlay Traction Company, capitalized for \$1,500,000, will build an electric railway from Toledo to this city.

Garrett, Ind.—The Garrett, Auburn & Northern Electric Railway Company was lately incorporated with \$10,000 capital stock. It will extend from this place to a point near the shore of Fish Lake in the extreme northern part of the State.

Iola, Kan.—The Secretary of State has issued a charter to the Iola Electric Street Railway Company, capitalized at \$50,000. The company proposes to build and equip the line this summer running through Iola and adjacent small towns in the gas belt. F. V. Crouch of Carrollton, Mo., is president.

Mattoon, Ill.—The directors of the Charleston & Mattoon Electric Railway Company have decided to issue bonds to the amount of \$200,000 for the construction of the proposed line between this city and Charleston, a distance of 12 miles. The promoters of the project are Forbes Holton of Huntington, W. Va.; Henry Rawie of Anderson, Ind., and prominent Coles County capitalists.

Maysville, Ky.—It is said that capitalists are taking the preliminary steps to construct an electric railroad from here to Tolesboro.

Newark, N. J.—A company is to be organized to build a trolley line from Bloomfield to Irvington. Representatives of Essex County capitalists have been busy in an effort to obtain the right of way from property owners. Among those behind the scheme are Francis M. Eppley and former Mayor George A. Smith of Vailsburg.

Republic, Wash.—The Ives Investment Company, owners of the California Mine, has in contemplation the construction of an electric railway between Grand Forks and this place.

Smithville, Ky.—The Louisville, Mt. Washington & Fairfield Electric Railway Company will build its proposed power house here. Judge W. B. Hoke is president of the company.

Trenton, N. J.—The Philadelphia, Trenton & New York Railroad Company, which is a link in the Johnson chain to connect New York and Philadelphia by trolley, has been incorporated with an authorized capital stock of \$500,000.

Warren, O.—The Cleveland & Chagrin Falls Electric Railway Company lately closed contracts for the private right of way from Garrettsville to this city.

Ymir, B. C.—The Ymir mine, near this place, is planning to make an immense improvement to the mining industry by building an electric tramway from the mine to this town, a distance of four miles. The tramway is to be used for the hauling of concentrates and for transporting supplies and timber to the mine.

Manufacturing.

Camden, N. J.—The E. L. Roe Electrical Company, capitalized at \$50,000, has been formed for the purpose of manufacturing electrical supplies.

Central Falls, R. I.—The Rhode Island Electrical Works has located here and will manufacture magnet wire.

New York City.—The plant and business of the insolvent National Electrical Manufacturing Company has been purchased by the Bunnell Telegraphic & Electrical Company of this city.—A concern known as the Traction Company and capitalized at \$250,000 has been organized here to manufacture traction engines. Herbert Knight David J. Newland and F. W. Roller are back of the enterprise.

Oconomowoc, Wis.—A proposition for the establishment of a factory for the manufacture of electrical instruments here has been submitted to the local business men's association.

Waukegan, Ill.—Blewitt Lee, Max J. Spiegel and Samuel Adams have organized the Porter Battery Company with a capital of \$300,000. The concern will manufacture electric storage batteries.

Company Matters.

Allentown, Pa.—R. Bachman, A. Missiner and S. P. Gemmel have organized the Star Electric Company. Besides doing a wiring and contracting business they carry a full line of electrical supplies. Dynamos and motors are overhauled by them and all kinds of repairing done.

East Orange, N. J.—The Morris Electric Company of New York will shortly build a factory here.

Power and Transmission.

Chippewa City, Wis.—The proprietors of the Stanley saw mill contemplate converting it into an electric power plant. The power will be transmitted to Chippewa Falls, and utilized for the motive power in the Stanley planing mill.

Davenport, Wash.—At a recent council meeting W. T. Steel and W. E. Eldrige, representing the Big Bend Light & Power Company, made application for a franchise through the streets of this city to transmit power from their plant on the Spokane River to the Big Bend Flour Mill. They also stated that they expected to spend \$250,000 in Lincoln County this year and next year. The council granted the prayer of the petitioners.

Phoenix, Ariz.—A party of hydraulic engineers has completed a trip to the Grand Canyon of the Colorado River, and reports that it will be possible to install a power plant in one of several places on the lower end of the canyon capable of supplying a greater horse power than is now being utilized at Niagara. It is said that a company of Eastern capitalists proposes to install large plants as soon as Government arrangements are perfected. Electric trolley line observation cars along the rim of the canyon for 15 miles are also contemplated.

The Dalles, Ore.—The Interstate Power Company has been incorporated to construct and operate an electric light plant at the mouth of the Deschutes River, for the purpose of generating and conducting electric power to points in Wasco, Sherman and other counties. E. Kurtz, W. M. Monod, H. L. Kuck and others are interested in the scheme.

Automobiles.

Franklin, N. H.—An automobile line between here and Tilton to take the place of the proposed electric line has been suggested.

Newport, R. I.—Despite the report that the New England Electric Vehicle Transportation Company has decided to wind up its affairs, it is stated that its branch here will be doing business at the old stand this summer, where a large number of orders for vehicles has already been booked, after which the depot may close.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by **ELECTRICITY** from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: cert indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Authorz'd	Issued.					Authorz'd	Issued.				
Albany, N. Y.—Apr 15						Hartford Conn.—Apr 15					
United Traction.....	100	\$5,000,000	\$5,000,000	1 1/2 % Q.	108 1/2	109 1/2	Hartford Street Ry. Co.....	100	\$4,000,000	\$200,000	8 % S., Oct.,
(Consolidation of the Albany and Troy City Railway.)							Hartford & West Hartford RR.....	100	1,000,000	247,000	—
Allentown Pa.—Apr 15						Holyoke Mass.—Apr 15					
Allentown & Lehigh Val Trac Co		4,000,000	1,500,000	—	18		Holyoke Street Ry. Co.....	100	400,000	400,000	8 % A., June,
Bridgeport, Conn.—Apr 15 :							Hudson N. J.—Apr 15				
Bridgeport Traction Co.....	100	2,000,000	2,000,000	1 % Aug.	103	—	North Hudson Co. (N. J.) Ry. Co...	25	1,250,000	1,000,000	8 %
Baltimore Md.—Apr 15							Indianapolis, Ind.—Apr 15				
United Railways & Elec. Co. com	50	24,000,000	18,000,000	—	17 1/2	17 3/4	Indianapolis Street Ry.....	—	5,000,000	5,000,000	—
Boston, Mass.—Apr 15							Lancaster, Pa.—Apr 15				
New England Street Ry.....	25	5,000,000	1,081,925	1 % Q., Jan. 15,	—	—	Pennsylvania Traction Co.....	100	10,000,000	9,900,000	—
North Shore Traction Co.....com.	100	4,000,000	4,000,000	—	15	16	Lancaster & Col. Electric Ry.....	—	—	87,500	—
North Shore Traction Co.....pfd.	100	2,000,000	2,000,000	6 % S. A. & O.	85	87	West End Street Railway.....	—	—	—	—
West End Street Ry. Co.....com.	50	10,000,000	—	8 1/2 % S., Oct., '99.	98	98 1/2	Louisville, Ky.—Apr 15				
West End Street Ry. Co.....s % pfd.	50	4,000,000	6,400,000	4 % S., Jan.	114	115	Louisville Ry.....com.	100	4,000,000	8,500,000	1 1/2 %
Boston Elevated R. R.....	100	10,000,000	—	2 1/2 % Aug. 99.	175 1/2	176	Louisville Ry.....pfd.	100	2,500,000	2,500,000	2 1/2 % S., Oct. 1.
Brooklyn N. Y.—Apr 15:						Minneapolis, Minn.—Apr 15					
Brooklyn City Ry.....	100	2,000,000	1,928,400	—	235	240	Twin City Rapid Transit.....com.	100	17,000,000	15,010,000	—
Brooklyn Rap. Transit Co., tr cert.	100	48,000,000	48,000,000	—	83 1/2	84	Twin City Rapid Transit.....s % pfd.	—	8,000,000	1,712,200	1 1/2 % Oct.
Brooklyn Heights Railroad.....	—	200,000	200,000	—	107	109	Montreal, Canada.—Apr 15				
Brooklyn City RR.....guar.	100	12,000,000	12,000,000	8 1/2 % Q., Jan.,	267	289	Montreal Street Ry. Co.....	50	4,000,000	4,000,000	8 % S. M. & N.
Brooklyn, Queens Co. & Sub. RR.	—	2,000,000	2,000,000	—	—	—	Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1 1/2 % S. J. & J.
Coney Island & Brooklyn RR.....	100	2,000,000	1,884,200	2 1/2 % Nov., '99	325	332	Memphis Tenn.—Apr 15				
Kings County Elevated.....	—	4,750,000	4,750,000	—	—	—	Memphis Street Railway Co.....	100	500,000	500,000	—
Kings County Traction Co.....	100	4,500,000	4,500,000	1 % July	—	—	New Haven, Conn.—Apr 15:				
Nassau Electric Railroad.....pfd.	—	6,000,000	6,000,000	—	75	80	Fair Haven & Westville RR.....	25	2,000,000	2,000,000	3 % S., Sept.
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000	—	—	—	New Haven Street Railway Co.....	100	1,250,000	1,000,000	2 1/2 % A., July
Brooklyn, B. & W. E. Railroad..	—	1,000,000	1,000,000	—	—	—	New Haven & Centerville.....	100	700,000	800,000	—
Buffalo N. Y.—Apr 15						New Orleans, La.—Apr 15					
Buffalo & Niagara Falls Elec. Ry...	100	1,250,000	1,250,000	—	74	75	Canal & Claiborne RR. Co.....	40	240,000	240,000	4 % S., July,
Buffalo Railway Co.....	100	6,000,000	5,870,500	1 % Q. Dec., 99.	99	100	New Orleans & Carrollton RR.....	100	1,200,000	1,200,000	1 1/2 % Q., Oct.
Columbus O.—Apr 15						New Orleans, La.—Apr 15					
Columbus Street Railroad.....	100	8,000,000	8,000,000	1 % Q., Feb.	36	39	New Orleans Traction Co new com.	100	—	—	—
Columbus Street Railroad, pfd...	100	1,500,000	1,500,000	—	92	98	New Orleans Traction Co new pfd.	100	—	—	—
Charleston, S. C.—Apr 15						New Orleans, La.—Apr 15					
Charleston City Ry. Co.....	50	100,000	100,000	8 % S.	—	—	Crescent City RR.....guar.	100	2,000,000	2,000,000	8 % S., Jan.,
Enterprise City RR. Co.....	25	1,000,000	250,000	—	—	—	New Or. City & Lake RR.....guar.	100	2,000,000	2,000,000	4 % S., Jan.,
Chicago, Ill.—Apr 15						New Orleans, La.—Apr 15					
Chicago City Ry. Co.....	100	12,000,000	12,000,000	8 % Q., Dec. 31, '99	260	265	Orleans Railroad.....	50	500,000	185,000	1 1/2 %
Chicago & South Side R. T. RR.....	100	10,828,800	10,828,800	—	14	1 1/2	St. Charles Street Railway.....	50	1,000,000	1,000,000	1 1/2 %
Lake Street Elevated RR.....	100	10,000,000	10,000,000	—	35 1/2	35 1/2	New York—Apr 15:				
Metropolitan West Side Elev. Ry...	100	10,000,000	7,000,000	Feb 28 1900.	88	88 1/2	Central Crosstown RR.....	100	600,000	600,000	2 1/2 % Q.
Met. West Side El., pfd.....	100	15,000,000	9,000,000	—	209	210	Christopher & 10th Sts. RR. guar.	100	650,000	650,000	2 % Q., Oct.,
North Chicago Street RR.....	100	10,000,000	6,800,000	8 % Q., Jan.	197	200	Dry Dock, E. Brdwy & Battery RR.	100	1,200,000	1,200,000	1 1/2 % Q., Nov.
North Chicago City RR.....	100	10,000,000	249,900	—	197	200	Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000	2 1/2 % Q., Feb. 1900
South Chicago City Railway.....	100	2,000,000	1,608,200	—	107 1/2	108	Bleecker St. & Fulton F. Ry. guar.	100	900,000	900,000	3 1/2 % A., July.
West Chicago St. RR. Co.....	100	20,000,000	18,189,000	1 1/2 % Q., Feb.	107 1/2	108	Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000	2 1/2 % Q.
Union Traction Ry.....com.	100	1,250,000	824,900	5 % S.	15 1/2	15 1/2	Gen. Park, N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2 1/2 % Q.
Union Traction Co.....pref.	100	2,000,000	2,000,000	—	57	58	Eleventh Avenue RR.....	100	1,000,000	1,000,000	—
Cincinnati, Ohio.—Apr 15:						New York—Apr 15:					
Cincinnati Inc. Plane Ry.....com.	50	1,000,000	875,000	—	—	—	42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	4 1/2 % Q.
Cincinnati Inc. Plane Ry.....pfd.	50	150,000	150,000	—	—	—	Ninth Avenue RR.....	100	800,000	800,000	—
Cincinnati, Newport & Gov. St. Ry.	100	8,000,000	8,500,000	2 1/2 % Feb.	75	76	Sixth Avenue RR.....	100	2,000,000	2,000,000	—
Cincinnati Street Ry. Co.....	50	18,000,000	14,000,000	1 1/2 % Q., Jan.	124 1/2	125	Twenty-third St. R. R. Co. guar.	100	600,000	600,000	4 1/2 % Q.
Mt. Adams & Eden Park Inc. Ry	50	2,500,000	2,200,000	1 1/2 % Q., Jan.	126 1/2	127	Second Avenue RR.....	100	2,500,000	1,882,000	2 % Q., Jan.
Cleveland, Ohio.—Apr 15						Newark N. J.—Apr 15					
Akron, Bld. & Clev. Elec. Ry.....	100	1,000,000	1,000,000	3 1/2 % Jan.	48	50	Consolidated Traction Co. of N. J...	100	15,000,000	15,000,000	—
Cleveland City Ry.....	100	8,000,000	7,600,000	3-5 % Jan.	102	102 1/2	North Jersey Railway Co.....	100	6,000,000	6,000,000	—
Cleveland Electric Ry.....	100	12,000,000	12,000,000	3 1/2 % Q., Oct., '99.	83	84 1/2	United Elec. Co. of New Jersey..	100	504,000	504,000	1 1/2 % A.
Detroit, Mich.—Apr 15						Pittsburg, Pa.—Apr 15					
Detroit Citizens' Street Ry.....	100	2,000,000	1,250,000	—	100 1/2	—	Allegheny Traction Co.....	50	500,000	500,000	—
Fl. Wayne & Belle Isle Ry.....	100	—	1,200,000	—	175	—	Consolidated Traction Co.....com.	50	15,000,000	15,000,000	2 % Jan.
Rapid Railway Co.....	—	250,000	250,000	—	90	100	Consolidated Traction Co.....pfd.	50	9,478,850	—	3 % Nov.
Detroit Electric Railway.....	—	1,000,000	1,000,000	—	100	110	Central Traction Co.....	50	1,500,000	—	1 1/2 % Nov.
Wyandotte & Detroit River Ry.....	100	250,000	200,000	—	—	—	City of Pittsburg Traction Co.....	50	8,000,000	—	6 % A.
Dayton O.—Apr 15						Pittsburg, Pa.—Apr 15					
City Railway Co.....com.	100	1,500,000	1,470,600	1 1/2 % Q.	140	145	Duquesne Traction Co.....	50	8,000,000	—	6 % A.
City Railway Co.....pf	100	600,000	600,000	1 1/2 % Q.	170	—	Pittsburg Traction Co.....	50	2,500,000	—	3 1/2 % Nov.
People's Street Railway.....	—	1,100,000	1,100,000	—	114	115	Federal St. & Pleasant Valley Ry..	25	1,400,000	—	2 % July,

Unlisted: Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.
b Leased to Boston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
g Owned by Atlantic Ave. RR. and leased to Nassau Electric.
h 90 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; \$200,000 of stock owned by North Chicago Street Railroad Company.
i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
j 30 per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,100 of stock owned by West Chicago Street Railroad Company.
k Majority of stock owned by Chicago West Division Railway Company; 5% on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

Unlisted: Full paid. Outstanding: Ex div.

a Leased to New Orleans Traction Company at 6% on stock.
b Leased to New Orleans Traction Company at 8% on stock.
c Leased to Central Crosstown Railroad at 8% on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavyon Ferry—now Metropolitan Street Ry.
g Leased to Metropolitan Street Ry. at 8% on stock until Oct. 1, 1897; thereafter 9%.
h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1895, at \$215,000 per annum.
i Leased to Met. St. Ry. for 99 years from April 20, 1892; 6% first 5 years, 8% thereafter.
j Leased to Metropolitan Street Railway for \$145,000 per annum.
k Leased to Metropolitan Street Railway for 18% on capital stock.
l Controlled by Third Avenue Railroad by purchase.
m Dividends of 15% yearly guaranteed by Consolidated Traction Company.
n Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.
o Leased to Consolidated Traction Company for 8% per annum on par value of stock.
p Leased to Fort Pitt Traction Company for 6% on \$8,000,000 capital stock.
q Leased to Consolidated Traction Company for 4% on capital stock.
r Leased to Consolidated Traction Company for 7% on capital stock.

TELEPHONE AND TELEGRAPH COS.

* Unlisted. † Paid in. ‡ Full paid. § Outstanding. ¶ Ex-div.
a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6% on stock per annum.
b Consolidation Electric, People's and Philadelphia Traction Companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
c Practically all shares owned by Union Traction Company.
d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
e Leased to Electric Traction Company.
f Controlled by Frankford & Southwark Passenger Railway.
g Leased to People's Passenger Railway at \$5 per share.
h Majority of stock owned by People's Traction Company.
i Leased to Union Traction Company.
j Lease transferred to Union Traction Company.
k Leased to Union Traction Company at a rental of \$10,000 per annum in 1886-7-8; in 1890-1899 and \$30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.
l Dividend of 10% guaranteed by Reading Traction Company.
m Dividend of 6% guaranteed by Reading Traction Company.
n Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

Boston, Mass.—Apr 15									
Fort Wayne Electric trust receipts..	..				115	125			
St. Wayne Elec. Co. T. Sec. Series A.	25				15	25			
General Electric Co. [old] .. com.	100	40,000,000	30,480,000	2% Q., Aug., 1900.	221	224 1/2			
General Electric Co. [new] .. com.	100	18,375,000	18,375,000	1% Q., Apr., 1900	221	224 1/2			
T. H. Elec. Co. T. Secur., Series C.	..				25	25			
Westinghouse Elec. & Mfg. Co. com.	50		145,700		65	65 1/2			
Westinghouse El. & Mfg. Co. pfd.	50	4,000,000	3,995,052	1% Q., Jan.	74 1/2	75 1/2			
Westinghouse El. & Mfg. Co. rights.	50	11,000,000	8,195,125		15 1/2	15 1/2			
New York.—Apr 15									
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000		119	120			
*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1% Q. Oct., '99.					
Edison Ore Milling Co. com.	100				8	12			
Electric Vehicle Co. com.	..								
General Electric Co. [old] .. com.	100	40,000,000	30,480,000	2% Q., Aug., 1900.	221	224 1/2			
General Electric Co. [new] .. com.	100	18,375,000	18,375,000	1% Q., Apr., 1900	221	224 1/2			
Interior Conduit & Insulation Co...	100	1,000,000	1,000,000		41	41			
Kings Co. El. L. & P. Co. com.	100	2,500,000	2,500,000	A. & O.	119	120			
Pittsburg, Pa.—Apr 15									
Allegheny County Light Co. com.	100	500,000	500,000	J. & J.	100	100			
East End Electric Light Co. com.	50	500,000	500,000	Q.					
Philadelphia, Pa.—Apr 15									
Edison Electric Light Co. com.	100	2,000,000			144	144 1/2			
*Electric Storage Battery Co. com.	100	3,500,000			65	65			
*Electric Storage Battery Co. pfd.	100	5,000,000			67 1/2	67 1/2			
Northern Elec. Light & Power Co..	10	550,000	550,000		15	15 1/2			
Southern Elec. Light & Power Co..	10	187,500	187,500		50	50			
Miscellaneous.—Apr 15									
Bridgeport (Conn.) Elec. Lt. Co.	25	500,000			47	48			
Missouri-Edison (St. Louis) com.	..				30	30			
Eddy Electric Mfg. Co. com.	25				9	9			
Hartford (Conn.) Elec. Light Co.	100	550,000			175	175			
Hartford (Conn.) Lt. & Power Co.	25	175,000			6	6			
New Haven (Conn.) Elec. Lt. Co.	100	100,000			105	105			
Narragansett (Prov., R.I.) Elec. Co..	50	1,300,000		2% Q., Oct.,	100	101			
Rhode Island Elec. Protec. Co.	100				114 1/2	115 1/2			
Royal Elec. Co. (Montreal) com.	..	1,525,000		1% Q.	118 1/2	119 1/2			
Toronto (Canada) Elec. Light Co.	100	1,085,000	1,085,000	1% Q.	103	103 1/2			
Thomson-Houston Welding Co. com.	100			3% S., Dec. 1,	100	100			
Woonsocket (R. I.) Electric Co.	100				100	100			

†On Aug. 17 last by a majority vote of the stockholders the capital stock was increased to \$20,827,500, of which \$18,275,000 is common and \$2,552,500 preferred.

‡Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

Boston Mass.—Apr 15:			
American Electric Heating Co.....	50	10,000,000	
Street Ry. & Illu'g Properties... pfd	100	4,500,000	1,248,700 32 p. sh.
United Electric Securities Co... pfd.	100	1,000,000	98.50 p.sh.
New York.—Apr 15:			
Consolidated Electric Storage Co....			
Safety Car Heating & Lighting Co....	100		
Worthington Pump Co.....com.	100	5,500,000	5,500,000
Worthington Pump Co.....pfd	100	2,000,000	2,000,000 7 % A
Philadelphia Pa.—Apr 15			
Electric Pneumatic Trans. Co.....	10	1,500,000	
United Gas Improvement Co...scrip.	50	10,000,000	
Welsbach Commercial Co.....com.	100	5,500,000	
Welsbach Commercial Co.....pfd.	100	500,000	1 % Q
Welsbach Light Co.....	5	825,100	
Welsbach Light Co., Canada.....	5	500,000	
Pittsburg, Pa.—Apr 15			
Carborundum Mfg. Co.....	100	200,000	200,000
Standard Underground Cable Co....	100	1,000,000	1,000,000 Q
Miscellaneous.—Apr 15			
*Barney & Smith Car Co.....com.	100		1,000,000
*Barney & Smith Car Co.....pfd.	100		100,000 1 %
Phillips & Spencer Co.....			
Cmasol. Car Heating Co.....	100	1,500,000	1,500,000 1 1/2 % Feb.
Johns-Fratt Co.....	100		
*Pratt & Whitney Co.....com.	100		
*Pratt & Whitney Co.....pfd.	100		
Gillwell-Bierce Co.....com.			
Gillwell-Bierce Co.....pfd.			1 % Jan.
Thulton Baiting Co.....		500,000	
St. Charles Car Co.....			
Unlisted.			

BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Apr 15, 1901

The Albany Ry. Co. Cons. mtg. 5s	\$500,000	427,500	1900	J. & J.	117%	118
The Albany Ry. Co. Gen. mtg. 5s	750,000	875,000	1907	M. & N.	116%	118
Watervliet Turnpike & RR. 1st mtg. 5s	850,000	850,000	1910	M. & N.	125%	127
Watervliet Turnpike & RR. 2d mtg. 5s	150,000	150,000	1910	M. & N.	124%	118
Troy City Railway Co. 1st mtg. 5s			1942		116	

Interest guar. by Albany Ry. Co.
Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Apr 15, 1901

United Electric Ry. Co. 1st mtg. g. 4s	33,000,000	18,000,000	1940	M. & S.	102%	102%
Income 4s	14,000,000		1940	J. & D.	74%	95
Baltimore City Pass. Ry. 1st mtg. g. 5s	2,000,000	2,000,000	1911	M. & N.	118%	120
Baltimore Traction Co. 1st mtg. g. 5s	1,500,000	1,500,000	1920	M. & N.	119	120
Baltimore Trac. Co. Exten. & Imp. g. 5s	1,250,000	1,250,000	1901	M. & S.	104%	121
Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121
Bal. Trac. Co. Coll. Trust 1st mtg. g. 5s	750,000		1900	J. & J.	101	101
Baltimore Traction Co. Convertible 5s	800,000		1906	N. & M.	102%	102%
Central Pass. Ry. Co. 1st mtg. g. 5s	96,000	117,000	1912	J. & J.		117
Central Pass. Ry. Co. Cons. mtg. g. 5s	604,000	580,000	1908	M. & N.	119	121
City & Suburban Ry. 1st mtg. g. 5s	8,000,000	8,000,000	1922	J. & D.	116	117
Lake Roland Elev. 1st mtg. g. 5s	1,000,000	1,000,000	1942	M. & S.	117	

All of the bonds of the above companies, marked +, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Apr 15, 1901

Lynn & Boston RR. 1st mtg. g. 5s	5,379,000	3,702,000	1924	J. & D.	114	115
West End Street Ry. Deben. g. 4s	2,000,000	2,000,000	1909	M. & N.	104%	106
West End Street Ry. Deben. g. 4s	2,000,000	2,000,000	1914	M. & S.	112	

181,074,000 in escrow to retire outstanding bonds of absorbed companies.

Charleston S. C.

Date of Quotation—Apr 15, 1901

Enterprise Street RR. 1st mtg. 5s	500,000	47,000	1906	J. & J.		
Charleston City Ry. 1st mtg. 5s	850,000			J. & J.	106	
Controlled by Charleston St. Ry. Co.						

Chicago Ill.

Date of Quotation—Apr 15, 1901

Chicago City Ry. 1st mtg. 4 1/2s	6,000,000	4,619,500	1901	J. & J.	101%	2%
Chicago Passenger Ry. 1st mtg. 5s	400,000	400,000	1908	F. & A.	102	
Chicago Passenger Ry. Cons. mtg. 5s	1,000,000	600,000	1929	J. & D.		
Chicago & So. Side R. T. 1st mtg. g. 5s	7,500,000	7,500,000	1929	A. & O.		
Chicago & So. Side R. T. 4 1/2s	1,500,000	700,000	1907	J. & J.		
Chicago West Div. Ry. 1st mtg. 4 1/2s	4,040,000	4,040,000	1932	J. & J.	108%	109
Lake Street Elevated RR. 1st mtg. g. 5s	7,574,000	8,781,200	1928	J. & J.		
Metrop. W. Side Elev. Ry. 1st mtg. g. 5s	15,000,000	15,000,000	1942	F. & A.	96	96%
North Chicago St. RR. 1st mtg. 5s	8,171,000	8,171,000	1906	J. & J.	106	
North Chicago St. RR. Cert. Indeb. 6s	500,000	500,000	1911	J. & J.		
North Chicago City Ry. 1st mtg. 5s	500,000	500,000	1900	J. & J.		
North Chicago City Ry. consol. 4 1/2s	2,500,000	2,500,000	1927	M. & N.	108	
West Chicago St. RR. 1st mtg. 5s	4,100,000	8,969,000	1928	M. & N.		
West Chicago St. RR. Deben. 6s	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR. Cons. mtg. g. 5s	12,500,000	6,000,000	1906		106%	107
W. Chicago St. RR. Tunnel. 1st mtg. 5s	1,500,000	1,500,000	1909	F. & A.		

Redeemable at option on 60 da. notice
Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.

Subject to call after Oct. 1, 1899, at 110 and interest.
Assumed by W. Chi. RR. Co., lessee
Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Apr 15, 1901

Qin. New & Cov. St. Ry. 1st Cons. mtg. g. 5s	8,000,000	2,500,000	1922	J. & J.	114%	115
Mt. Adams & Eden Pk In. 1st mtg. 6s	46,000	46,000	1900	A. & O.	108%	104
Mt. Adams & Eden Pk In. 1st mtg. 6s	100,000	100,000	1905	A. & O.	114	
Mt. Adams & Eden Pk In. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108%	
So. Cov. & Qin. St. Ry. 1st mtg. 6s	250,000	250,000	1912	M. & S.	121%	122%
So. Cov. & Qin. St. Ry. 2d mtg. 6s	400,000	400,000	1922	J. & J.	182%	187

1250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Apr 15, 1901

Brooklyn Street RR. Co. 1st mtg. 5s	500,000	600,000	1908	M. & S.	106%	107
Qin. New & Cov. St. Ry. Cons. mtg. 5s	8,000,000	2,500,000	1922	J. & J.	114%	115
Cleveland City Cable Ry. 1st mtg. 5s	2,000,000	2,000,000	1909	J. & J.	105%	106
Columbus (O.) Cent. Ry. 1st mtg. g. 5s	8,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry. 1st mtg. g. 5s	1,500,000	1,500,000	1918	M. & N.		
East Cleveland RR. 1st mtg. 5s	1,000,000	1,000,000	1910	M. & S.	107%	
Fl. Wayne (Ind.) Elec. Ry. 1st mtg. g. 5s	900,000		1922	M. & N.		
Lorain (O.) Street Ry. 1st mtg. 6s	30,000	200,000	1915	J. & J.		
St. Ry. Co. Grand Rapids. 1st mtg. 5s	600,000	600,000	1912	J. & D.		

11,900,000 in escrow to retire bonds of absorbed companies, marked a.
Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Apr 15, 1901

Detroit Citizens' St. Ry. 1st mtg. 5s	7,000,000	8,885,000	1906	A. & O.		102%
Fl. Wayne & Belle Isle Ry. 1st mtg. 5s	400,000	877,000	1902	A. & O.		
The Detroit Ry. 1st mtg. 5s	1,800,000	1,800,000	1922	J. & D.	105	106%

181,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Apr 15, 1901

New Haven St. Ry. 1st mtg. g. 5s	600,000	600,000	1918		111	
New Haven (Edgewood Div.) 1st mtg. 5s	250,000	250,000	1914	J. & D.	111	
Winchester Avenue RR—1st mtg. g. 5s	100,000	600,000	1912	M. & N.	109	
Winchester Avenue RR—Deben. g.	100,000	24,000	1915	M. & S.		

New Orleans La.

Date of Quotation—Apr 15, 1901

Canal & Claiborne RR. Cons. mtg. 5s	\$150,000	\$150,000	1911	M. & N.		
Orleans City RR. 1st mtg. 5s	50,000	50,000	1899	M. & N.	105%	
Orleans City RR. Cons. mtg. g. 5s	5,000,000	3,000,000	1940	J. & J.		
New Orleans City RR. 1st mtg. 5s	416,500	899,000	1908	J. & D.	108	112
N. Orleans City & Lake RR. 1st mtg. g. 5s	5,000,000	2,599,500	1940	J. & J.	112	118
Orleans & Carrollton RR. 2d mtg. g. 5s	850,000	850,000	1907	F. & A.		
Orleans Railroad Co. Cons. mtg. 5s	800,000	800,000	1912	J. & J.		
St. Charles St. RR. Co. 1st mtg. 5s	800,000	75,000	1907	J. & D.		

18428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.
1890,000 outstanding.

New York

Date of Quotation—Apr 15, 1901

Atlantic Ave. (Brooklyn) Imp. g. 5s	1,500,000	1,500,000	1904	J. & J.	95	
Atlantic Ave. (Brooklyn) 1st gen. mtg. 5s	759,000	759,000	1909	M. & S.	107%	110
Atlantic Ave. (Brooklyn) Cons. mtg. 5s	8,000,000	1,966,000	1981	A. & O.	115	116
Bro'dway & 7th Ave. 1st cons. mtg. g. 5s	12,500,000	7,650,000	1948	J. & D.	128	128
Bro'dway & 7th Ave. 1st mtg. 5s	1,500,000	1,500,000	1904	J. & D.	104	105%
Bro'dway & 7th Ave. 2d mtg. 5s	500,000	500,000	1914	J. & J.	108	110
Bro'dway Surface. 1st mtg. 5s	1,125,000	1,125,000	1924		115	117
Bro'dway Surface. 2d mtg. 5s	1,000,000	1,000,000	1905		105	106
Brooklyn City RR. Co. 1st cons. mtg. 5s	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown. 1st mtg. 5s	2,000,000	2,000,000	1909	J. & J.	115	116
Brooklyn Bath & W.E. RR. Gen. mtg. 5s	1,000,000	448,000	1933	J. & J.	101	
Brooklyn Heights RR. 1st mtg. 5s	250,000	250,000	1941	A. & O.	104	
Brooklyn, Q's Co. & Sub'n. 1st mtg. 5s	8,500,000	8,500,000	1941	J. & J.	112	
Brooklyn, Q's Co. & Sub'n. 1st cons. 5s	4,500,000	2,750,000	1941	M. & N.	107	
Brooklyn Rapid Transit. gold 5s	7,000,000	5,181,000	1945		109%	
Cent. Pk. N. & E. R. RR. 1st cons. mtg. 4s	1,200,000	1,200,000	1902	J. & D.	107	109
Central Orosstown RR. 1st mtg. 5s	250,000	250,000	1922	M. & N.	125	
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1908	J. & J.	101	108
3d Dock, E. B'd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1932	J. & D.	117	120
Dry Dock, E. B'd'y & Bat'y R. scrip 5%	100,000	1,100,000	1914	F. & A.	102	106
Eight Ave. RR. Co. Cert. Indeb. 6%	000,000	1,000,000	1914	F. & A.	108	
42d St., Man. & St. Nich. Av. 1st mtg. 6s	200,000	1,200,000	1910	M. & S.	116%	117
42d St., Man. & St. N. Av. 2d mtg. Inc. 6s	1,500,000	1,500,000	1915	J. & J.	89	
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s	5,000,000	5,000,000	1908	M. & S.	124	125
Metropolitan St. Ry. Co. g. m. cl. tr. g. 5s	12,500,000	12,500,000	1907	F. & A.	120	
Second Avenue Ry. Gen. cons. mtg. 5s	1,600,000	1,600,000	1909	M. & N.	120	121
Second Avenue Ry. Deb. 5s	800,000	800,000	1909	J. & J.	108%	109
Steinway Ry. (L. I.) 1st mtg. g. 5s	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co. 1st mtg. 5s	850,000	850,000	1919		110%	112%
Third Avenue RR. 1st mtg. g. 5s	5,000,000	5,000,000	1907	J. & J.	128%	
Twenty-third Street Ry. 1st mtg. 5s			1906	J. & J.		
Twenty-third Street Ry. Deb. 5s	150,000	150,000	1906	J. & J.	108	108
Union (Huckleberry) Ry. 1st mtg. 5s	2,000,000	2,000,000	1942	F. & A.	118	118
Westchester Electric RR. 1st mtg. 5s	500,000	500,000	1948	J. & J.	110	114

184,850,000 in escrow to retire maturing obligations.

1852,000 in escrow to retire 1st and 2d mtg. bonds.

In treasury, \$80,000

Guar. by Union Ry. Co.

Toronto Canada

Date of Quotation—Apr 15, 1901

Montreal St. Ry. 1st mtg. 5s	2,500,000	800,000	1902	M. & S.		
Toronto St. Ry. 1st mtg. g. 4 1/2s	4,550,000	2,200,000	1921	M. & S.		

1835,000 per m. single track authorized

9600,000 in escrow to retire 6s due in 1901

Philadelphia

Date of Quotation—Apr 15, 1901

Greene & Coates St. Ry.	1st mtg. 6s	
Lombard & So. St. Pass. Ry.	1st mtg. 6s	
People's Pass. Ry.	1st mtg. 7s	
People's Pass. Ry.	2d mtg. 7s	
People's Pass. Ry.	Cons. mtg. 5s	
People's Pass. Ry.	Stk. trs. cert. g. 4s	
Phila. City Passenger Ry.	1st mtg. 5s	
Philadelphia Trac. Co.	Coll. tr. g. 4s	
Thirteenth & 15th St. Ry.	1st mtg. 7s	
Union Passenger Ry.	1st mtg. 5s	
Union Traction Co.	Col. tr. 4s	
West End Passenger Ry.	Stk. trs. 7s	
West Phila. Pass. Ry.	1st mtg. g. 6s	
West Phila. Pass. Ry.	2d mtg. 6s	

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bid.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—Apr 15 1901						
Jefferson Avenue Ry.....1st mtg. 5s.	270,000	270,000	1905	M. & N.	112	113
Lindell Ry. Co.....1st mtg. 5s.	1,500,000	1,500,000	1911	F. & A.	117	118
Missouri RR. Co.....1st mtg. 5s.	1,000,000	700,000	1916	M. & S.	105	106
Mount City RR. Co.....1st mtg. 5s.	400,000	800,000	1910	A. & O.	104½	105½
People's RR. Co.....1st mtg. 5s.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 7s.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 5s.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric.....1st mtg. 5s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
St. Louis & Sub. Ry.....1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5s.	800,000	800,000	.....	.....	80	84
Southern Electric Ry.....Cons. mtg. 5s.	500,000	500,000	1909	M. & N.	106	108
Taylor Avenue St. Ry.....1st mtg. g. 5s.	500,000	500,000	1918	J. & J.	116 ½	117½
Union Depot RR. Co.....1st cons. mtg. 5s.	1,091,000	1,091,000	1900	A. & O.	100	106½
Union Depot RR. Co.....Cons. mtg. 5s.	8,500,000	1,787,000	1918	J. & J.	121	122
†Controlled by St. Louis RR. Co.						
†Controlled by Union Depot RR. Co.						
†Controlled by Lindell RR. Co.						
†\$200,000 in escrow to retire 1st & 2d mtg.						
†\$500,000 in escrow.						
††\$200,000 in escrow to retire 1st mtg bds.						
San Francisco Cal.						
Date of Quotation—Apr 1901						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
Ferries & Cliff House Ry.....1st mtg. 5s.	550,000	550,000	1914	M. & S.	.....	117
Geary St., Park & Ocean RR.....1st mtg. 5s.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. g. 5s.	8,000,000	8,000,000	1918	J. & J.	126½	.....
Metropolitan Ry. Co.....1st mtg. 5s.	200,000	.....	.....	.....	.....	.....
Omnibus Cable Co.....1st mtg. 5s.	2,000,000	2,000,000	1918	A. & O.	126½	.....
Park & Cliff House RR.....1st mtg. 5s.	350,000	350,000	1912	J. & J.	105½	107
Park & Ocean RR.....1st mtg. 5s.	250,000	250,000	1914	J. & J.	115	.....
Powell St. Ry.....1st mtg. 5s.	700,000	700,000	1912	M. & S.	.....	125
Sutter St. Ry. Co.....1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	.....	.....
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Apr 15, 1901						
Belt Ry. Co.....Cons. mtg. 5s.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 5s.	500,000	500,000	1914	A. & O.	182	.....
Eckington & Soldiers' Home.....1st mtg. 5s.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 5s.	500,000	500,000	1901	J. & J.	.....	.....
†\$50,000 in escrow to retire 1st mtg. bds.						
Miscellaneous.						
Date of Quotation—Apr 15, 1901						
Bridgeport Traction Co.....1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 5s.	5,000,000	3,548,000	1981	F. & A.	118	.....
Chicopee St. R. (Ind'polis).....1st cons. m. 5s.	4,000,000	3,000,000	1988	M. & N.	104	105
Crosstown St. Ry. (Buffalo).....1st mtg. 5s.	8,000,000	2,866,000	1982	M. & N.	112	118
Columbus (O.) St. Ry.....1st cons. g. 5s.	8,000,000	2,261,000	1982	J. & J.	115	.....
Consolidated Traction (N. J.).....1st mtg. 5s.	15,000,000	18,965,000	1983	J. & D.	111½	111½
Crosstown St. Ry. (Columb.).....1st mtg. g. 5s.	2,000,000	572,000	1988	J. & D.	115	115½
Denver City Cable Ry.....1st mtg. g. 5s.	4,000,000	8,800,000	1920	J. & J.	20	.....
Denver Con. Tram'g Co.....Con. m. g. 5s.	4,000,000	922,000	1988	A. & O.	80	85
Louisville (Ky.) Ry.....1st cons. mtg. g. 5s.	5,000,000	4,981,000	1980	J. & J.	119	119½
Minneapolis St. Ry. (N. J.).....Cons. mtg. g. 5s.	5,000,000	4,050,000	1919	J. & J.	110½	110½
No. Hudson Co. Ry. (N. J.).....Cons. mtg. 5s.	8,000,000	2,878,000	1928	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.).....2d mtg. 5s.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.).....Deb. 5s.	500,000	489,000	1902	F. & A.	.....	.....
Paterson (N. J.) Ry.....Cons. mtg. g. 5s.	1,250,000	1,000,000	1981	J. & D.	.....	.....
Rochester (N. Y.) Ry.....1st mtg. 5s.	8,000,000	2,000,000	1980	A. & O.	.....	.....
St. Paul City Ry.....Cons. g. 5s.	5,500,000	4,298,000	1987	.....	105½	106
St. Paul City Ry.....Deb. g. 5s.	1,000,000	1,000,000	1900	.....	108	.....
†\$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
†\$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
†\$750,000 in escrow to retire bonds of C. St. RR. Co.						
†\$87,000 in treasury.						
†\$960,000 reserved to redeem prior liens						
†\$820,000 in escrow.						

*With int. res.

ELECTRIC LIGHT AND ELECTRIC RAILWAY MFG. CO'S

Boston, Mass.						
Date of Quotation—Apr 15, 1901						
Delaware Gas Lt. Co.....1st m. 5s. g.	800,000	800,000	.....	J. & J.	106	106
Edison Elec. Illuminating Co., Boston.....	2,026,000	.....	.....	Quar.	187	.....
General Electric Co., gold coup. deb. 5s.	10,000,000	8,750,000	1923	.....	116	.....
Pittsburg Pa.						
Date of Quotation—Apr 15, 1901						
Allegheny County Light Co.....5s.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Scrip. 5s.	195,570	.....	.....	M. & S.	.....	.....
Miscellaneous. —(Apr 15, 1901.)						
Edison El. Ilg. Co. (N. York) 1st m. 5s.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,189,000	1998	.....	124	.....
Edison Elec. Ilg. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122½	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	.....	1987	A. & O.	100	101
Kings Co. El. Lt. & Po. Co. pur. money 5s.	5,175,000	.....	1997	A. & O.	120	122
Milwaukee El. Ry. & Lt. Co. 1st con. g. 5s.	8,000,000	.....	.....	F. & A.	102½	.....
United Elec. Light & Power Co. (N. Y.).....	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—Apr 15, 1901.						
American Bell Telephone.....4s.	.....	.....	1908	F. & A.	100½	101
Northwestern Telephone Co.....7s.	.....	.....	.....	.....	.....	.....
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 5s.	.....	.....	.....	.....	114	115
Chesapeake & Potomac Teleph. Co.....5s.	.....	.....	1911	J. & D.	108	116

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—Apr 15, 1901						
American Electric Heating.....7s.	500,000	500,000	.....	.....	.....	.....
Armington & Sims Engine Co.....6s.	.....	.....	.....	.....	.....	.....
Barnes & Smith Car Co.....6s.	.....	.....	1942	J. & J.	106	107
Carborundum Mfg Co.....6s.	.....	.....	1904	J. & D.	.....	.....
Worthington Pump Co.....6s.	75,000	.....	.....	.....	115	127
Unlisted						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16¾c.; Lake, 16½@16¾c. casting, 16½@16¾c.

General Electric furnished the spectacular movement of the week by jumping about 20 points.

The International Electric Company, capital \$3,000,000, has been incorporated under New Jersey laws.

It is understood that nothing will be done in the Chicago elevated railway consolidation matter for some time.

The Citizens' Light & Power Company of Rochester, N. Y., will vote May 2 on increasing the capital stock to \$2,500,000.

The annual meeting of the New England Telephone and Telegraph Company will be held May 6. Books close April 25 and reopen May 15.

Business failures in the United States last week numbered 203, against 193 the same week last year; in Canada there were 24, against 41 last year.

The Philadelphia Electric Company's report for the year ended December 31 shows a surplus of \$131,497, or about 2½ per cent. on the amount paid in.

It is stated that the Chattanooga Rapid Transit Company will absorb the Chattanooga City Electric Railway Company and other lines into one system, with a capital of over \$1,000,000.

A consolidation of the important gas and electric light companies of Cincinnati has taken place under the name of the Cincinnati Gas and Electric Company with a capital stock of \$28,000,000.

The Metropolitan Elevated Railroad Company of Chicago has authorized \$5,000,000 4 per cent. 27-year extension bonds, subject to redemption at 105 on any interest day on four weeks notice.

The position of the copper market seems to be a firm one with considerable business going on at the full basis of 17 cents for Lake ingot. Of recent sales for export, 17 cents was the basis of the trades.

Shareholders of the American Railway Electric Light Company, the Columbian Electric Car Lighting and Heat Company and the United Electric Company will meet April 24, 25 and 26, to act upon the proposition to sell the stock of each to the Refrigerator Company.

The following are quotations for some of the industrial stocks not quoted elsewhere: Electrical Lead Reduction, 4½@4¾; Electric Boat, 20@20½; Electric Vehicle, 11@13; Tel. & Tel. Company of America (full paid) 6@7; Electric Company of America, 8½@8¾; National Carbon, 16@16½.

The Delaware General Electric Railway Company on Monday filed with the Recorder of Deeds for Kent County, Delaware, a mortgage for \$1,000,000 given to the Knickerbocker Trust Company of New York City for the construction of the Kent County trolley, work on which is to be begun this week.

The Electric Vehicle Company has decided to issue \$1,675,000 6 per cent. bonds. The bonds have been underwritten at 90 by a syndicate which agreed to take all that are not subscribed for by the stockholders of record at the close of business April 22. The \$1,507,500 derived will more than pay off all existing debts of the Electric Vehicle Company, and the surplus will be paid into the treasury to be used for working capital.

The Printing Telegraph Company said Monday: "The American Railways Company will ask the Chicago city council for a fifty-year franchise for a new south side elevated railroad. The road is to extend from Van Buren street to Sixty-third street in a southerly or southeasterly direction. South of Sixty-third street the line can extend within the city limits. A five-cent fare for a continuous ride over the road and its branches is provided for. It is to be operated by electricity or some equally clean motive power."

The Philadelphia "Stockholder," says: "It is believed in traction and market circles that important developments involving the Pittsburg traction systems are near at hand, which, when announced, will be followed by sharp price advancements. Of what nature expected developments are to be is not known; but the character of recent buying in Philadelphia Company and Consolidated Traction common are believed to suggest something favorable to stockholders in both companies. Consensus of opinion is that consolidation of the Pittsburg traction systems are being considered, and before very long all its systems will be merged into one similar to our Union Traction. As mergers and combinations are the order of the day, it would not seem to be a difficult matter to complete a consolidated trolley system in Pittsburg."

The Boston "News Bureau" says "the Erie Telephone situation is becoming intensely interesting as there are rumors of a possible contest for control. The Telephone, Telegraph and Cable Company bought in February, 1900, a controlling interest in the stock, 50,001 shares at \$115 per share. Later, to secure financial assistance for Erie, it parted with 29,000 shares of the stock of the company at \$100 per share, retaining 21,000 shares, which now stand at an average cost of \$137.38 per share. Soon after the transfer of the 29,000 shares to the Eastern people the stock was raided down to \$48 per share for the purpose of compelling the owners of the 21,000 shares and the holders of the 29,000 shares to throw over their stock. Various rumors come to the front, one to the effect that the American Bell Telephone Company proposed to buy Erie at its own price. After the decline to \$48 there was a quick rally to \$66 and persons friendly to Bell interests are credited with buying 15,000 shares. Indications now are that the Cable Company is endeavoring to average up its holdings with a view to again securing control and the new interests at present owning 15,000 shares may try to secure control in the interests of the Bell Company. If Bell again loses its control of Erie and it passes into the hands of the Independents who, it is said, have already arranged with a large trust company to finance Erie on a broad and liberal basis, all stock purchased under par by the Cable Company will reduce the cost of their present 21,000 shares."

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EDITORIAL NOTES.

The Independent Telephone Association Convention.

The Independent Telephone Association of the United States of America will hold its next Convention in Buffalo, N. Y., on June 11, 12 and 13. The programme, which has not as yet been definitely decided upon, is expected to be elaborate, and there is no doubt but that it will prove as profitable and enjoyable as those of former meetings. It was decided to hold the Convention in Buffalo on account of the Pan-American Exposition being there, which was a most happy thought, as it will not only afford members of the Association an opportunity of seeing the sights, but it will also enable the representatives of the Pan-American countries to inspect the high grade telephonic apparatus manufactured by the independent companies.

Provision as usual has been made with the railroads to carry the visitors at one and one-third fare for the round trip, while a committee will arrange for special rates at the hotels for those attending the Convention.

This year's meeting should prove most instructive and enjoyable, and there should be a feeling among the members of work well done now that the Berliner patent incubus has been thrust aside. That the recent decision means much to the independent telephone movement is clearly shown in the increased number of independent telephone companies that have been incorporated of late. Capital that has been held back is now evidently being put forward and it will not be long before the independent movement will cause the monopoly more anxiety than it has heretofore.

* * *

Some Important Electrical Doings.

Just at present there are a number of important things going on in the electrical industry that should prove of interest to the electrical fraternity. In the first place—what should interest investors—the General Electric Company has just issued a circular letter announcing that, upon the written request of any holder of preferred stock of the company, the preferred stock of such holder shall be received in exchange for common stock, and that certificates for common stock shall be issued therefor, share for share, upon surrender and cancellation of the certificates for the preferred stock received

upon such exchange. The time of making such exchange has been limited to the period beginning the 15th day of May and ending the 1st day of August.

Holders of preferred stock desiring to avail themselves of the opportunity of making such exchange must, within the period above prescribed, present to the Farmers' Loan and Trust Company their certificates, duly indorsed in blank, together with a written request for such exchange in the form furnished herewith.

The certificates for common stock will be issued only in the name of the registered holders of the preferred stock surrendered for exchange.

In the development line a dispatch from Montreal, Canada, states that an application for incorporation is now being considered by the Canadian Parliament from a concern which asks most extraordinary powers, perhaps greater than has ever before been requested from the Dominion of Canada. The bill is for the incorporation in Canada of the St. Lawrence Power Company, now operating at Massena, N. Y.

The intentions of the company with respect to Canada are shrouded in mystery, but its purpose in the United States is well known. The company already has a charter, obtained from the State of New Jersey, and under its authority is developing 150,000 hp. at Massena, N. Y., sixty miles from Montreal, where it is its purpose to establish an extensive manufacturing community, attracting all possible industries to that locality. Of the 150,000 horse power, just half will be turned into electricity.

The remarkable powers asked by the new company from the Canadian Government would enable it to carry on an enormous business, of which the supplying of light and power to a city like Montreal would form a very small part. It asks for the right to manufacture, use, supply, and dispose of electricity, water, gas, and hydraulic and other power; to maintain works for the production, sale, and distribution thereof, and for these purposes may construct and operate canals, water courses, raceways, and water powers in or adjacent to the St. Lawrence River at any points eastward from Dickenson's Landing, and construct dams, wing dams, sluices, conduits and buildings.

It also wishes to acquire patent rights, manufacture and dispose of pulp wood, calcium carbide, acetylene gas, and other carbide pro-

ducts, mine minerals, construct furnaces, ovens, etc.; construct tramways, wharves, own vessels, conduct a towing business on the St. Lawrence and adjacent waterways, and other things.

Incidentally it is reported that the Canadians do not relish this so-called "American invasion."

Another mammoth scheme is heard of from Connecticut. The Legislature of that State passed a bill a few days ago giving great powers to the Consolidated Lake Superior Power Company, a twenty-million dollar corporation. According to the terms of the bill the company is permitted to engage in owning and operating railroads, steamships, sailing vessels, express business, furnishing water and light, to buy and sell all kinds of stocks, bonds and securities, and it may do business in the United States and Canada. The company may increase its capital stock as it sees fit, but may not operate in Connecticut unless under a special charter.

From the above it will be seen that there are a number of important electrical undertakings on foot, to say nothing of a \$90,000,000 telephone combination which, it is rumored, is about to be organized.

* * *

Electricity and Railroads.

In a recent edition of a New York newspaper there appeared an interesting article from the pen of Albert L. Johnson, entitled "The Trolley Age." The author took the stand that the steam railroad was practically doomed, and the near future would see this country covered with a network of high speed electric roads. Referring to the subject Mr. Johnson says:

"I say we must start afresh, from the ground up, discarding the cumbersome and expensive mode of operation now in use on the steam railroads. We must adopt the electric system, in which each individual car is supplied with its own motive power, and can be run as often as necessary, with nothing to earn beyond its own cost of operation, over a track honestly built and owned by a company capitalized for the actual cost of its plant, with franchise rights for which no money has been paid as tribute to the servants of the people. These servants have been placed in office by the people to subserve the interests of the people. Installation and security in a secure place does not mean that a public office is a private enterprise.

"I consider the electric system of transportation still in its infancy. What the future will bring forth no man can tell. But to-day it is a living fact, the speed and carrying capacity being limited only to the roadway and the power of the motor."

As an example, Mr. Johnson refers to the line that he is engaged in building between Philadelphia and New York, which will be provided with a roadbed conforming in every way to the highest standard in use by steam railroads. Commenting on the benefits to be derived by the adoption of electricity in lieu of steam, Mr. Johnson states that the cheap fare, frequency and accessibility of service, picking up and letting off of passengers practically at the doors of their homes, will create a volume of traffic which cannot be estimated. It will educate the city man by putting him in contact with his country brother. The former will get acquainted with the latter. One will learn the true details of the country and country life; the other will learn of the city

and city life. Both must be broadened and benefited.

The author concludes as follows:

"Thus far I have touched on the electric system, solely as applied to the transportation of passengers. The true function of the electric line is the carrying of both freight and passengers, not only between cities, but within the cities themselves, under conditions and at times that will not interfere with the traffic on the streets. With the proper roadbed and efficient motors, loads equaling the capacity of the largest freight cars can be handled quickly and economically by the electric system. Every car being an individual unit, capable of easy self-propulsion, can be sent singly forward to its destination, without the necessity of making up train loads in order to obtain the maximum load at the minimum cost of operation.

"In the beginning the freight business of the electric lines may be confined to package freight and the country products required daily for the support of the population of the towns and cities.

"Vested interests have ever been, in their origin, the parents of progress; in their maturity, its guardians; in their age, toll takers on its path."

The idea of converting steam railroads to electrically operated roads is no new thing, as it has been in the minds of many engineers for some time. The great drawback to the scheme would seem to be—as we pointed out in an editorial on January 26, 1898—that when it comes to equipping a trunk line railroad with electricity the interest on the large sums of money that would have to be invested in copper and in building power stations would be considerably greater than the cost of the fuel saved. It is true that since referring to this subject the three-phase method of electric traction has been developed and adopted to advantage on a number of lines abroad, but what would be gained in economy in such a system over the direct system, would be more than sacrificed by the well-known disadvantages that a polyphase alternating current system necessarily entails. In short, as we pointed out and demonstrated by figures over three years ago, electricity is as yet not well adopted to the operation of trunk line railroads in spite of Mr. Johnson's optimistic views to the contrary.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

THE Ohio Supreme Court has decided that street railroads have the right to carry freight.

A DISPATCH from London states that the Cunard Company has decided to install the Marconi wireless telegraphy on its ships.

THE General Electric Company has donated \$15,000 to the city of Schenectady with which to purchase a site for the proposed \$50,000 library to be erected by Andrew Carnegie in that city. The condition imposed by Mr. Carnegie is that the city appropriates \$5,000 annually for the maintenance. This has been met and the building will soon be erected.

A DISPATCH from Carlisle, Pa., to the N. Y. "World" states that "Daniel Drawbaugh, of Eberly's Mills, who claimed in the courts for

many years to be the inventor of the telephone, at the age of seventy-four has stumbled across an inexplicable electrical current of high potentiality. He has devised a small machine to demonstrate its existence. A private exhibition of the apparently new energy at Dickinson College on Friday last completely puzzled the scientific experts who were present. Mr. Drawbaugh's machine is very small, and is constructed similarly to the electro-magnetic apparatus found on telephone instruments. He turns on the positive and negative currents, subsequently short circuiting them, whereupon he draws another and an apparently unknown current from another part of the diminutive apparatus. The short circuited current and the third current combined make a powerful flow of electricity. Mr. Drawbaugh is at a complete loss to trace the origin of the power, and will build a new machine for further experiments at Dickinson College. Local experts declare that Mr. Drawbaugh has seemingly discovered a new and easy method of producing a strong electrical current, which will undoubtedly be of value in wireless telegraphic work."

THE Legislature of Minnesota has appropriated \$60,000 for the State University at Minneapolis, for the College of Engineering. Most of the money will go into the electrical laboratory and lighting plant.

AN interesting electric light buoy is now moored in the North Sea before Bunsum, in Holstein, to give warning of the dangerous sands at that place. Even a slight motion of the waves generates sufficient electricity for illumination, and clock-work in the interior regulates the half-minute lighting and extinguishing. Tests of this automatic light have proven so satisfactory that the extensive use of such buoys is predicted.

ELECTRICITY is used for cracking nuts in St. Louis, Mo., thousands of tons being submitted to that process annually.

It is understood that the deadlock between the two underground railroads, in London, is ended, and that a contract has been signed, by the terms of which both systems will be simultaneously equipped with electric power.

THE Miami and Erie Canal is to be equipped with electricity in the near future, a contract having recently been let for fifty boats to cost \$1,200 each. The power house will it is understood be erected near Hamilton, O.

AN apparatus for heating water for different purposes has lately been patented. The device consists, so it is claimed, of a series of pipes connecting inlet and outlet chambers, the pipes being covered with coils of resistance wire, and the entire warmer incased in a jacket of cement, which tends to aid in heating the pipes. With the switch which accompanies the apparatus the current can be turned into all or a portion of the wires surrounding the pipes to regulate the heat, as indicated by the names on the dial. The apparatus can be made in all sizes, and it is intended to use the heater in connection, not only with the stationary tank in residences, but also for travelers. With one of these heaters stored away in the trunk the traveler need never worry about not being provided with hot water at the hotels, as all that

is necessary is to attach a socket in place of one of the incandescent electric lights, when a turn of the switch will run the current through the wires and heat the water contained in the chambers.

THE President on Monday appointed Edward B. Moore of Michigan, to be Assistant Commissioner of Patents.

THAT the Bell monopoly is making money may be inferred from the fact that Frederick P. Fish, its newly-elected president, is to receive a salary of \$100,000 a year. Might it not be a good idea to reduce rates slightly and salaries proportionately?

A TRIAL of storage batteries for automobiles is being arranged to take place on June 1 next, at Paris, under the auspices of the Automobile Club of France. The trials will be made to ascertain the efficiency of the batteries submitted.

THE site has been selected on Barclay Sound, West Vancouver Island, for the landing place for the Pacific cable. It consists of one hundred acres, and will be laid out as a town and cottages built for employees.

THE purchaser of the plant heretofore in use by the United Light and Power Company of Georgetown, Col., for supplying electric power on the new tunnel into Covode Mountain will not only furnish the needed supply for all company purposes, but will provide also for the extension of an economical motor to many of the operations on Silver Mountain. Ample water is available at all seasons of the year, to insure against a resort to steam for maintenance of power, and the consequent saving in cost to the consumer will induce the early adoption of electricity at the leading mines.

THE Detroit, Mich., Romeo, Rochester & Lake Orion electric suburban line has decided to make a strong play against the regular steam railroad lines running from Detroit to the various points which it covers in conjunction with them. The electric line schedule is slower than the steam line, but to prepare for the comfort of its patrons it has ordered special cars which will feed the passengers of the road in route from Detroit to the various summer resorts and suburban points on its line. It proposes to cover this new feature of suburban traffic by having the conductors solicit the passengers for breakfast, luncheon and dinner orders on the various cars and having these orders supplied from the proper stations along its route.

PRESIDENT L. R. Adams of the Automobile Club of Long Island and A. Ward Chamberlain of the Automobile Club of America on April 18 traveled over the hundred miles that is to be the scene of the endurance test of the Long Island organization. Ninety-five direction signs were placed along the route by employees of the club in the course of the day, and there is little danger of competitors losing their way over the course. The steepest road was found to be on a hill near Roslyn, L. I., where, in the Wheatley Hills section of Long Island, the grades are very steep. A change in the course is announced. At Douglaston, L. I., the route will go northward into Great Neck, and the North Shore again will be taken up at Manhasset. From Hicksville, L. I., the route has

been changed, and will run through Farmingdale to Amityville, L. I.; thence to Massapequa by way of Central Park. The start and finish will be at Jamaica. Competitors from all parts of the country are here for the test, which promises to be one of the greatest trips and events in the new pastime ever known.

THE storm which raged last Saturday and Sunday worked great damage to telegraph lines in and around Chicago, so much so that communication between New York and the Windy City had to be made by way of Montreal.

NEW YORK exporters will no longer be required to affix revenue stamps to export bills of lading. Charles H. Treat, Collector of Internal Revenue for New York, made the announcement Saturday. New York exporters claim that they have paid \$40,000 in such revenue during the three years the act has been in effect. It has been declared unconstitutional, and the \$40,000 will be refunded.

ANOTHER connecting link in the trolley line from Philadelphia to New York was secured last Saturday, when the Trenton, Lawrenceville and Princeton Railroad was formally transferred to the syndicate headed by Albert L. and Tom Johnson.

THE system of trolley lines which was equipped by the United Tramways Company of London, England, but has been delayed getting to work for fear of interruption being caused to the magnetic instruments at Kew Observatory, is now in full swing, the objections having been somehow or other removed. It is stated that the delicate instruments which have been the cause of the trouble are to be removed where electric tramway currents are not likely to trouble them. This is the first electric trolley line to be operated upon a public way, either in or near London. Many miles of extension are being equipped for electrical service.

OWING to the number of companies advertising in America to sell stock in wireless telegraphy and telephone companies, on which large dividends are promised, Mr. G. Marconi, before sailing for Europe on the steamship Campania, requested his counsel, Mr. E. H. Moeran, to cause the publication of a letter, in which Mr. Marconi denies that he is associated in any way with any American company, having for its object the development of wireless telegraphy in this country.

HERR EWALD RASCH describes in the "Elektrotechnische Zeitschrift" for February 14, an arc light, says the London "Electrician," obtained by the use of solid refractory electrolytic electrodes which have to be heated to start with as in the case of the Nernst lamp. With electrodes 2.5 mm. diameter a pressure of 50 volts and a current of 2 amperes, 630 Hefner candles (horizontal) was obtained, and with electrodes 5 mm. diameter and 5.3 amperes at about 42 volts, 900 candles was given out, or about 4 candles per watt in each case. Experiments were made with 2.5 mm. electrodes, varying the current; with 1.1 amperes at 65 volts the candle-power was 146, the current was then gradually increased to 5 amperes when the voltage dropped to 45 and the candle-power increased to 1,012, but at this stage the electrodes fused; in fact, it was advisable for steady

working to keep the efficiency down to from 3 to 4 candles per watt. The author points out that Tumirz, in his paper "On the Mechanical Equivalent of Light," gave the ideal efficiency as 5.21 candles per watt, and as a result of these experiments it was found that the highest efficiency obtained was 5.2 when the metal fused. It must, however, be pointed out that the electrodes become convex so that probably the greatest illumination would be horizontal, and no tests of the spherical candle-power are given in the paper. Dr. W. Nernst, referring to this article in the "Elektrotechnische Zeitschrift" of March 21, attaches considerable importance to this point, which he considers militates against the practical employment of Dr. Rasch's electrolytic arc, and makes its efficiency no longer phenomenal. He further remarks that no figures are given in Dr. Rasch's article for rate of consumption of the electrodes. His own experiments with electrodes of a material similar to that employed in his incandescent lamp, showed that the negative and not the positive electrode burns away the quicker (a phenomenon which he thinks may have an important bearing on the theory of the arc) and that the quick consumption would prevent the construction of a practical lamp on these lines.

A RECENT mishap in Liverpool, where a live wire trailing on the ground after disconnection made considerable havoc, has led an inventive Englishman to devise means to prevent its recurrence. Ordinary overhead wires are provided with a fuse which should melt when a breakdown occurs, but, as was shown in Liverpool, this expectation is not always realized. The Englishman's invention is a secondary circuit. It is above the main cable, alongside the companion wire, but is insulated from the main cable. In the event of the main cable becoming broken an automatic switch connected with the companion wire would be operated in the main station to disconnect the circuit from the main cable.

BALTIMORE advices say that plans are well advanced in the formation of a new and large security holding company, with a total authorized capital of \$5,000,000, which will make a specialty of controlling, operating and constructing street railways in various cities throughout this country. The proposition to consolidate the street railway lines in San Francisco is one of the enterprises in which the new company is interested. It is understood from an authoritative source that the enterprise will be very broad in its character and that offices will be opened not only in Baltimore, but in New York and other leading cities.

Now that the time has come when electricity can be conveyed over a wire and utilized at a distance of many miles from the point of development its practical possibilities have been greatly increased. A swift mountain stream or a cataract may be made to yield up its power, and this power may be transmitted without material loss of energy to towns on the plains where it has great value to man. The success achieved along this line in California is of genuine interest, and electricity carried over short distances is finding new applications constantly. The most recent of these is in pumping water to irrigate arid lands. Several installations of this kind have already been made.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 24.

THE TELEPHONE AND TELEPHONE PRACTICE.

(Continued.)

All central exchanges should be equipped with accurate and convenient means for testing lines and circuits so that, if at all possible, the trouble on a circuit may be determined and located before sending a trouble man out, as a great saving of time by this means can be secured. There are very few exchanges, outside of those in large cities, thus equipped and it is surprising the slow, old-fashioned means for doing this work that are still indulged in.

How often we have seen the inspector, when a line is in trouble, take down the hand magneto, hanging conveniently by, with a couple of flexible cords attached and connect it to the line. If the bell will ring the line is O K and if it will not ring it must be open. This is the full extent of the test.

In this article I will describe a simple and effective testing outfit and circuit that can be used on any system.

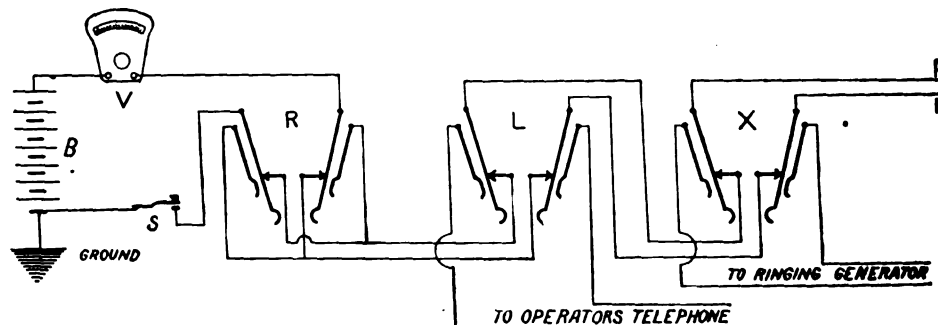
A central exchange should be supplied with a testing table equipped with the following apparatus: A low-reading voltmeter, a reversing key, a test battery, a ringing key, a talking set with a switching key for throwing the line from the test circuit to the talking circuit, and a simple means for connecting the test circuit to any line so that the line may be tested outward towards the substation with the switchboard circuit disconnected and also to test the circuit toward the switchboard with the line disconnected. This can generally be arranged by having suitable terminals at the cross-connecting or distributing frame.

If the exchange be of the common battery type the same battery which operates the system may be used for testing with, but if it is a local battery exchange a number of cells of primary battery aggregating about 15 volts should be provided for use in testing.

Fig. 1 describes the arrangement of the apparatus and circuit, B the battery, grounded at the negative pole, V the voltmeter, S strap key, R reversing key, L the listening key for throwing the line from the test circuit to the test operator's telephone and X the ringing key. In a small exchange the ringing key is not necessary and the test operator may use a generator on his telephone for ringing. The ringing key is only provided when the "power" generator is used in the exchange, then it is very convenient. If keys such as are described in the figure cannot be secured, then four point strap switches (Fig. 2) can be used in their place. PP represents the test cord or lead which may be attached to clips or some other convenient means for connecting to the line terminals.

This circuit as given is the plain, simple necessary circuit and may be extended however by an ingenious telephone man to include extra apparatus convenient for different purposes. After arranging a testing outfit as just described, a piece of paper, semi-circular in

form, should be pasted on the voltmeter directly above the dial upon which should be marked a resistance scale. To arrange such a scale, first connect the voltmeter directly across the battery to be used for testing and at the point indicated by the voltmeter needle mark on the paper 0 (zero). Then connect a "bridge" resistance in series with the voltmeter so that any known resistance may be cut in series with it. First cut in 100 ohms and note the point there indicated by the needle and mark it 100. Repeat this proceeding, adding an additional 100 ohms each time and marking the point where the needle rests until as much as you wish of the entire scale is marked off in this manner. You can readily see the advantage of this, for if a line is being tested the position of the needle will indicate approximately the resistance of the circuit without the operator having to figure this out from a formula.



In the operation of testing with this test circuit connected to a line note as follows. If one side of the line be grounded you would get a reading on the voltmeter with the reversing key R thrown in one direction and no reading when thrown in the other. If the two conductors of the line be connected together through the ringing coils of a telephone bell, as they usually would be on general system work, then the side of the line which was grounded would be indicated by the highest reading, as on the other side there would be the added resistance of the bell in the circuit of the volt-

are crossed together the resistance of the cross, as indicated by the voltmeter, will show whether the lines are "dead" crossed or closed together through a telephone. If one side of a line be open and the other grounded you would get a reading on one side to ground and no reading on the other, either with or without the strap key S.

If a circuit is being tested which has a condenser in series with the bell, as in common battery systems, the charge and discharge of the condenser will be indicated by the voltmeter needle giving a momentary deflection when the strap key is kept closed and the reversing key worked back and forth.

To determine whether there is a loose connection on a line or not, hold the strap key closed and allow the current to flow around the circuit. If the needle varies it will indicate such to be the case. If there is no variation in the current before the subscriber comes in on

the line, and there is after he does, that will show that the loose connection or poor contact is in the subscriber's instrument.

There are very few troubles about a line or instrument that an experienced operator, handling a test circuit such as just described, cannot determine what they are and in most cases locate them before sending a trouble man out to clear them.

Article No. 25 will be entitled "The Telephone and Telephone Practice" (continued).

HINTS FOR ENGINEERS.*

BY H. W. WAKEMAN.

An asbestos plug cock makes a very good blow-off cock. Engineers used to argue concerning the advisability of turning the plugs of these cocks more than one-quarter revolution, but such discussions were suddenly cut off by the appearance of plugs that could not be turned more than 90 degrees.

Many of the valves found in modern steam plants have removable disks, so that when one leaks it can easily be repaired. A supply of these disks should always be kept on hand, as it may not be convenient to buy one when it is wanted.

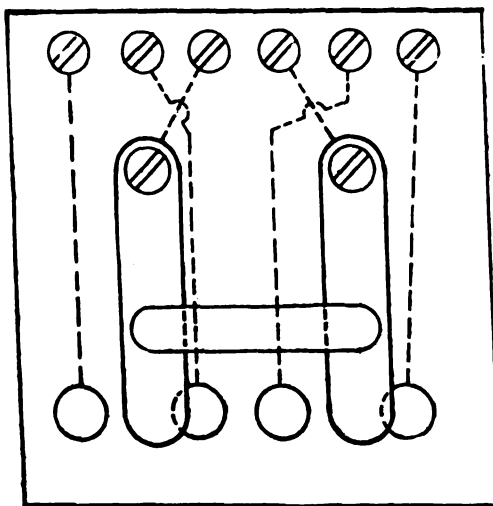
When an engine runs "under" it always has an awkward appearance.

If you are not paid as much money for running your engine as you consider the job worth, do not fail to keep the plant in first-class condition, for visitors will not stop to inquire how much salary you receive.

When calculating the speed of an engine, begin with the governor pulley, just as if it were the driving pulley on a shaft.

If it is necessary to use the common globe check valves when piping up a steam plant

*From the "Wood Worker."



meter to ground. If both sides of the line be grounded you would get a reading on both sides or in either position of the reversing key. If the lines be crossed together but not grounded the voltmeter would give a reading only when the strap key S was closed. If both sides of the line be open and clear there would be no reading whatever. When two conductors

use one size larger than the pipe, as they will work with less friction.

Leaky boiler seams should never be calked with steam pressure on the boiler.

One hundred pounds of wood are equal to forty pound of good coal, so far as steam-making qualities are concerned. A cord of hickory wood is worth much more than a cord of chestnut, but the latter does not weigh as much as the former, so that for equal weights, their value is equal. It is assumed that the wood is thoroughly seasoned.

Before you attempt to carry your indicator box away by the handle, be sure that the lid is locked or hooked, as otherwise you may find the indicator on the floor.

An injector requires steam for its successful operation; hot water will not answer the purpose.

Ground joints on cylinder heads of steam engines are good things, as they save packing and trouble, but they must be used carefully when taken apart, as it does not require much to make them leak. Before they are put together both surfaces should be well cleaned, and treated with cylinder oil.

Locate the blow-off valve as near your boiler as possible.

Plumbers often use wax for making joints on gas pipes, in order to prevent leaks, but red or white lead will do for ordinary work; if there are small leaks the joints may be varnished.

When fitting up a water tank for use in the upper story, or perhaps on the roof, locate the outlet pipe in the side near the bottom. Do not let it project on the inside, but have it funnel-shaped, with the inner end flush with the inside of tank. That is the way to secure the greatest efficiency; in other words, the proper way to get the most water through the pipe in a given time.

When an engineer thoroughly understands the machine that he has charge of he has made a good point, but he cannot claim to be well informed in the business until he has a good working knowledge of several other kinds. He should also study up the man who owns the machine he is running, for failure to do this may result in complete dissatisfaction, when he in reality is a competent engineer.

When it is desired to connect into a pipe, say two inches or less in diameter, it is frequently cheaper to break a cast iron L than to disconnect several joints.

If you intend to use a heavy cylinder oil in a cold place, buy a downward-drop lubricator.

Be sure to close the drip cocks on your engine when it has attained full speed.

The tensile strength of a rivet is usually much greater than its shearing strength, but this is counterbalanced by the fact that when two boiler plates are riveted together, the friction which must be overcome before they can be torn apart is very great.

Do not roll sheet packing into a bundle of small diameter, but spread it on a broad shelf.

Some pumps have hand levers to start them with in case the valve gear fails to work, while others have none because it is claimed that none is needed. I prefer the former.

It is a good plan to let your engine exhaust into your heating system, but it is not necessary or advisable to have the inner surface of the pipes coated with the dregs of cylinder oil. It is well to put a separator in the exhaust pipe and locate it near the engine.

Do not do anything to discourage yourself. This means that if you are an engineer, striv-

ing to keep an old plant in good order, do not count the hours you work each week (unless you are fortunate enough to be paid by the hour), for they may mount up to an alarming figure and so operate to dishearten you.

Heating by direct radiation means that the radiators are located directly in the rooms to be heated.

Resin makes a very poor belt dressing.

Do not attempt to tighten the nuts on a flange coupling under steam pressure.

What a great number of reasons are given for boiler explosions as we hear of them from day to day! If all were correct it would prove a steam boiler to be a very complicated and unsafe thing to handle, or work around, but fortunately some of these reasons do not exist outside of the fertile brain of those who exploit them for their own benefit. A boiler explodes because it is not strong enough to stand the pressure that is put upon it, and that covers the whole ground. The boiler may be new, with defects that render it at once unsafe, and when working pressure is put upon it there is trouble, or it may be old and gradually grow weaker until it fails under an ordinary pressure. Of course, it takes an experienced engineer to tell when it has become unsafe, but there is nothing supernatural about it, as some people would have us believe.

THE APPLICATIONS AND REQUIREMENTS OF A PRINTING TELEGRAPH.*

BY ROMYN HITCHCOCK.

Many efforts have been made by inventors to produce a practical printing telegraph which will supersede the Morse key in the telegraph business of the world, and many failures and disappointments have resulted. It is not an unusual experience that inventions of great ingenuity and apparent value have been perfected at large expenditure of time and money, only to discover that they are not wanted in the commercial world. We hear much of "the state of the art" whenever new devices are brought forward, but the state of the art, as shown in the records of the United States Patent Office, may be quite different from the conditions which prevail in practice. Inventors are by nature optimistic. They are not, however, usually able to accurately gauge the conditions under which their inventions must compete with existing devices. Superiority in certain directions may be offset by conditions which are practically prohibitory of the application of improvements which effect minor economies, although in the aggregate the saving may be large.

The writer has followed the development of the printing telegraph for many years, and while recognizing the value of a thoroughly good, cheap and reliable device of this nature, for special applications, there are obvious and good reasons for believing that it can never be introduced for the general telegraphic work of the great companies. The most that can be said in favor of the general use of a printing telegraph is that it practically doubles the speed of transmission by the Morse key. The further claim is made that it will reduce the cost of operating by permitting the substitution of typewriters for expert telegraphers.

Regarding the increase in speed, the advantage is not sufficiently great to be attractive in itself, particularly when the considerable cost of the instruments and keeping them in order

*From the "Telegraph Age."

is taken into account. The direction of improvement in telegraphy is certainly above all in an increase of speed of transmission; but this increase must be very much greater than the printing telegraph, by reason of its mechanical and electrical limitations, can ever realize. Machine transmission, at a speed far beyond any system now in use, is destined to be the great universal system of the future.

Regarding the plausible argument of economy in operating, this is illusory, because of the erroneous assumption that a general telegraph business can be successfully conducted by untrained operators. Granting that the parsimonious methods which characterize the present telegraph monopoly in the payment of faithful employees leads to a large average of inefficiency and loss of time, all important lines, on which service must be maintained under the most adverse conditions, are necessarily in charge of experienced men, and the introduction of printers on such lines would require equally good if not superior qualifications in the operators, who would have more than a simple key and relay to control. This is particularly true when the printers are duplexed, as they would necessarily be for this service. The balancing of the line for duplex working would require about the same skill as now is demanded of quadruplex operators. It is likewise doubtful if competent typewriters could be secured for the same low wages that the Western Union now pays for ordinary Morse operators.

For these and other reasons, which the practical telegrapher will immediately recognize, the printing telegraph operated from a keyboard can never compete with the Morse key for general telegraph service. In reply to this it may be said that the old Hughes printers is still used on several British lines, and the Baudot system is used in France. While these systems may be referred to as indicating the practicability of operating printing telegraphs over long lines, they do not meet the requirements for universal application. A close inquiry into the reason why the Baudot system is used in France will indicate that the intrinsic merits or advantages of the system are not the only considerations.

Nevertheless, a printing telegraph which fulfills certain specific requirements would doubtless find use on particular lines operated by the telegraph companies, and especially on certain railroad lines. At stations where the operators are required to be frequently absent from their posts on other business, the printing telegraph can be so arranged that it will receive messages while no one is present; at least it will be unnecessary to have a regular telegraph operator at every insignificant station on the line, since any person can quickly learn to use the apparatus.

However, telegraphers need not have misgivings concerning the introduction of the printing telegraph. A few of them may be changed about; but the way is opening for a large expansion of the telegraph service, and experienced telegraphers will not only be more and more in demand, but their services will be more adequately recompensed than they are now.

A much larger field for the printer is in connection with the telephone, or in the line of special wire connections between offices, factories, warehouses and homes. This field is not yet occupied by any similar device. It is virgin ground, unexplored and undeveloped. But it

has its possibilities. Some years past the writer was in London, and in conversation with a gentleman connected with the telautograph was much interested to learn of an important use which has been made of that ingenious invention. A certain piece of machinery was wanted immediately and the factory was located a long distance from the business office in the city. Ordinarily some hours would elapse before the order could be delivered at the factory, since it was necessary to submit a diagram. Having telautograph connection, the order was immediately written on the machine and the diagram drawn out and sent over the wire. The printing telegraph will not make the diagram, but otherwise it fulfills the purpose which the telautograph was intended to accomplish, and for which it was confidently believed that admirable invention would be largely used.

However perfectly the telautograph may operate, it is too slow for general commercial use. No person will write when a typewriter can be employed, and the relatively few cases in which fac simile signatures are necessary in wire communications scarcely warrant the hope of a very general use of the telautograph.

The introduction of the printing telegraph in connection with the telephone, however, is eminently practical and offers an attractive field for enterprise. Verbal communications are not always satisfactory to either party. Frequently they are subject to confirmation by letter, and perhaps the letter never comes. While the line is in use for speaking one may say "Please put that down in writing," and forthwith the telephone is switched off and the printing telegraph is switched on, and the writing is done. Moreover, if a man is absent from his office, a message can be recorded on his printer, which may be securely locked in his desk. There is thus no waiting to be called up when some one returns to receive the communication.

The "state of the art" in printing telegraphs, as revealed by the Patent Office, shows great activity and ingenuity. It is quite evident, however, that most of the inventors have entered the field without a very clear conception of the most serious obstacles to success. The first question asked of an inventor when he has completed his machine is, "Will it operate over a telegraph line?" The assumption is that if it will operate over a line the problem is solved. And so it is, but the practical difficulties in producing a printing telegraph are not, as might be and usually is inferred, in the line operating. Experienced telegraphers can meet any reasonable exactions in the line working, and the real difficulty is not in the line requirements, but in the printing mechanism. Here, then, is the stumbling block which has blasted the hopes of a multitude of inventors.

For a clear understanding of the requirements, we should separate in our minds the line working, which pertains to telegraphy, from the printing mechanism, which usually is, or at least may be, a separate contrivance designed to operate with such impulses as the telegraph line transmits. One great reason for the failures in this field has been that almost every inventor has undertaken to construct a printing mechanism of his own, while the real merit of his invention is in the transmission of electric impulses and the distribution of them at the receiving end. The man who can accomplish this in the best way

is not usually the sort of man who can design a printer, and the less he meddles with this part of the work the more quickly his invention will take practical form. For demonstration of his system an ordinary typewriter, in the absence of anything better, will suffice, and when this has been accomplished a suitable printing mechanism must be adopted.

It is a problem with which many keen inventors have wrestled, and some wonderfully complex and delicate, but not very satisfactory, contrivances have been evolved by experimenters. Therefore, it is assuming too much to suppose that one has only to give an order to a mechanic and he will forthwith evolve a practical printer. Inventions cannot usually be made to order. To one who knows what is necessary in this connection, and who is acquainted with some of the past efforts, the supreme confidence with which inventors undertake to accomplish results, each for himself, regardless of what others have learned, is not indicative of a clear conception of the difficulties to be overcome. Much time is often wasted in projecting new devices without regard to the experience of others. Inventors generally, and many mechanics, are abnormally sensitive to the least suggestion of a limitation to their ingenuity or skill, and a proposal to refer to the work of others is likely to be received with great disfavor. But it is the part of wisdom and a broad knowledge of men and affairs to combine past experience with the best special skill to accomplish a result.

No printing telegraph can be successful which operates a commercial typewriter. The nearest approach to a successful machine of this kind seems to be the Himrod printer, in which the mechanism of the typewriter is actuated through the medium of compressed air. But the Himrod printer was handicapped by a keyboard with two shift keys, and a method of manipulating the shift key which was confusing to an inexperienced operator. The objection to a typewriter machine is that it requires too much power to operate it. From a superficial view the power for printing is quite independent of the line impulses, since the relays have only to complete circuits from local batteries, which may have currents of any required strength. But practically the relay contacts restrict the amount of current which can be carried within comparatively narrow limits, and, moreover, the duration of the contacts must be sufficient to enable the mechanical movements to be perfected. For this reason the typewriter imposes limitations in speed, and while it is possible to operate under favorable conditions as rapidly as the keys can be used in practice, the margin of effective work is too near the limit of practical requirements to admit of absolute reliance.

No system of printing which involves synchronous movements at distant points can be universally successful, and there are serious objections to any system of multiplexing which gives the line to different writers in succession. Perhaps the greatest defect of such systems, apart from their liability to be interrupted by line disturbances, is the necessary limitations they impose on the duration of contacts. Whether the combinations transmitted for each letter are many or only three, if we are to insure the greatest possible effectiveness and certainty of working, they should not be of uniform duration, since the last impulse should always be made as long as possible to allow for the mechanical work which has to

be done in striking the letter. The whole problem now is, to reduce the force required to do this mechanical work. Here is the one remaining element of weakness in the printing telegraph.

The use of the printing telegraph can be greatly extended in the general telegraph field if the transmission can be made very much more speedy. Machine transmission, with a printer that will operate at a speed of a hundred words a minute as a minimum in each direction, while working duplex, would bring the system into rather close competition with the Wheatstone, with corresponding advantages of considerable value. The Buckingham machine is operated in this way, but it is difficult to understand how that rather complex mechanism is able to transmit words with the speed claimed for it. If that machine works at the rate of one hundred words a minute, with six impulses over the line for every letter and space, then it is assuredly possible, with other means, to greatly exceed that speed of transmission and printing.

In the writer's opinion, not much can be accomplished by new inventions in the direction of improving the purely telegraphic part—that is, the line working and the local receiving and distributing systems—of the printing telegraph as it stands to-day. Improvements will doubtless be made in minor mechanical details, but the broad principles of operating are doubtless as well worked out generally and as much simplified in principle as is possible.

What is now required is a simple printer to which these principles can be applied. Here is a field for inventive genius. The man who can make the simplest practical mechanical page-printer, to work like a typewriter, and which can be operated with the least possible power at a speed of more than one hundred words a minute, will deserve a rich reward.

In some telegraph systems the printing mechanism is an integral part of the local distributing devices. To these an independent printer would not usually be applicable. But with all those systems in which the last line impulse perfects a combination to operate a key or a printing lever it would be of use.

The tendency of the day in science and the arts is toward specialization. The best and surest progress is made when work is done by men having special qualifications for it. If the construction of a printer for telegraph use is taken up by skilled mechanics, we may anticipate an early solution of the problem which has thus far baffled the inventors of printing telegraphs.

Transformer of High Potential Difference with a Cathodic Voltage Raiser.

M. P. Villard brought to the attention of the French Physical Society, at a meeting held on March 9, a transformer made by the Carpentier firm, which had an efficiency of 50,000 volts in the secondary, derived from 110 volts in the primary circuit. The secondary circuit contained two condensers embodied in the apparatus and modifying the circuit to remove all danger. The limits were determined by a "cathodic valve" which absorbed one of the alternations, leaving only the difference of potential almost equal to that of a Ruhmkorff coil. The other electric alternation which can not get through the valve is used up in making electric sparks. This arrangement gives the remarkable effect of raising the voltage of the available alternation. Without utilizing the

valve the sparks do not exceed 9 to 10 centimeters in length, but when the valve is in use the sparks are 18 centimeters between the ball terminals and 24 centimeters in length between pointed terminals.

PARIS LETTER.

Special Correspondence of *ELECTRICITY*.

Electrical Oscillations from the Nerves.

At the meeting of the Academy of Sciences of Paris, March 11, M. d'Arsonval presented a communication from M. Carpentier of Nancy, relating to the nature of electrical oscillations that are produced through the medium of a nerve which is electrically excited during a short period of time. It was demonstrated that a short electrical excitation produced a double transmission on the part of the nerve of an alternating current; positive during half of its period and negative during the other half.

The Metropolitan Railway of Paris.

The subscription to the new shares of the Metropolitan Company, which has recently opened, has been a great success. This is due to the constant increase of the company's receipts, which continue at present to be very great. During a period of six days the company has collected 153,556 francs. In one day the line carried 113,868 passengers. There are at present 626 trains in constant service, which average 32.94 per hour. There are 2,504 cars, which means 131.78 in use per hour. The total distance traveled by these cars is 6,447.8 and the receipts per train kilometer have increased until they have reached 6,324 francs. The company is now meeting all of its expenses, including the payment for franchise services to the city, and shows a net profit of 27 per cent. on the gross receipts. This profit will certainly be larger when the preliminary expenses have become normal over the whole length of lines for which concession has been obtained, for it must not be forgotten that there is only one line, the Vincennes-Porte-Maillot, being at this time in service.

An Electrical Theft.

It is a well known fact that electrical meters are working very badly, and that there are a large number of errors which the consumer considers when his bill is presented at the end of each month by the company for current consumed that leads to considerable wrangling. This condition of affairs had the effect of very much exciting one Mr. S. of Paris who looked for a remedy for the constantly growing increase of his ordinary constant consumption of current. He conceived the idea of boring a hole through the door of the meter, and of inserting a screw-eye for the apparent purpose of hanging up his consumer's note-book, but after the company's agents had made their inspection and noted the reading Mr. S. took the screw-eye out and inserted in the hole a long needle which paralyzed the motion of one of the smaller working parts of the apparatus in such a way as to cause a smaller reading, so that the greater the consumption of current the lower became the bill to be paid at the end of the month. The official of La Place Clichy was notified by a neighbor of Mr. S., and the company's agents prepared a trap for him, composed of two movable contact pieces placed in the meter-box, and so constructed that the east push through the hole brought the pieces

in electrical contact with each other, and thereby establishing a short circuit. The trap was no sooner installed than Mr. S. again commenced his operations with the immediate result of a violent blinding flash of light. Mr. S. went to the official to complain of this startling phenomenon, and was very much alarmed by the way his meter was operating. They tried to calm him, but complaint was made to a court of justice and after a lawsuit the Tenth Chamber sentenced Mr. S. to three months in jail and to pay a fine of 300 francs, and two official announcements in the public press.

Electric Traction in Paris and its Suburbs.

There are a considerable number of Parisian tramway companies, there being not less than 12 who operate altogether 76 lines of which 23 are horse lines and 53 operated by mechanical traction. Franchises have now been granted for 590 kilometers, of which 420 belong to the latter class. In 1898 there were only 291 kilometers of street railway of which all were operated by horses except 84 kilometers. It is plainly to be seen the rapidity with which this growth has taken place during the last two years. Seven lines are operated by compressed air motors, steam motive power with different

velli surface contact system, of which there is one line in the Bois de Boulogne.

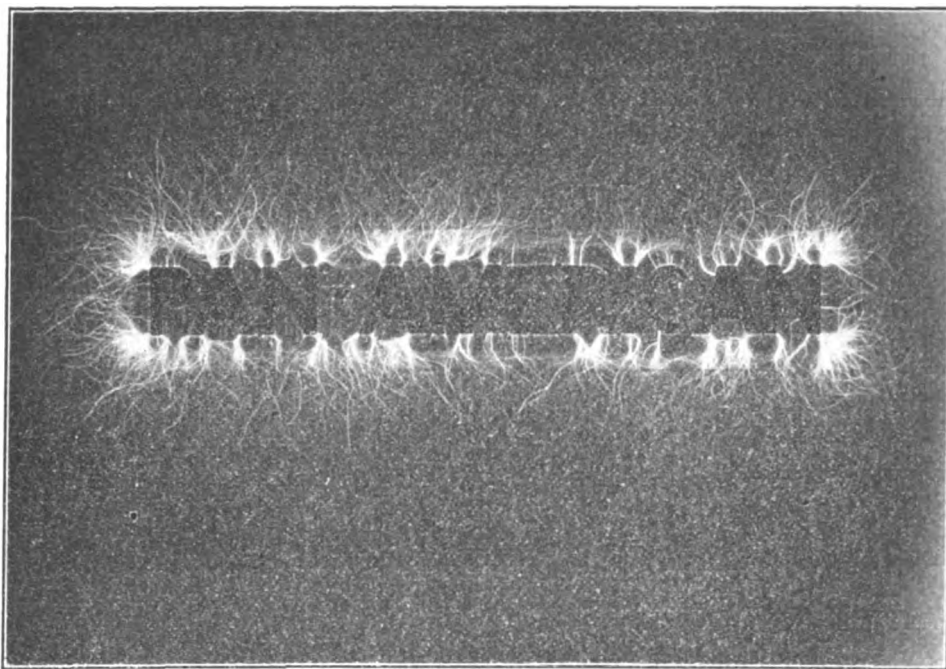
The Diatto system operates under an 80 kilometer franchise, but it undoubtedly will be annulled before long on account of the numerous accidents which are continually taking place, and has been previously brought to the attention of your readers in one of my previous letters.

ELECTRICAL EFFECTS ON THE PAN-AMERICAN MIDWAY.

BY FRANK C. PERKINS.

With the approaching day of opening the Pan-American Exposition grounds are rapidly assuming a more attractive appearance, and it is with pleasure that the Exposition officials announce that, notwithstanding the contrary statements which have appeared, the buildings and exhibits will be in a more nearly completed state than any of the recent expositions at Paris, Omaha or Chicago.

From the tower at Niagara Falls an enormous searchlight will be used and the Horse Shoe and American Cataract will be brilliantly illuminated with white and varying colors. The scene will be indescribable, even exceeding the wonderful effect of the whirlpool



HIGH POTENTIAL WORK AT THE PAN-AMERICAN EXPOSITION.

systems of boilers operate ten lines and there is only one using cable traction and four are operated by electric motors.

First—Accumulator traction is used for seven tramway lines in Paris and is in competition with the overhead trolley running outside of Paris to Clamart, to Malakoff and to Neuilly, etc.

Second—We have the Canivcan underground system operating two tramway lines, Montparnasse to l'Etoile and to the Bastille. These are in competition with the overhead trolley running outside of Paris to St. Ouen and to Villemonble.

Third—The overhead trolley system is allowed only outside of the fortifications and is used for operating or will operate over 31 lines, of which only 10 are now in actual service and are to be taken into consideration. The others are under process of construction.

Fourth—The Diatto surface contact, of which there are 8 lines in Paris, and the Vedo-

and rapids in the Niagara Gorge of last season, when illuminated with searchlights and colored lights. The Observation Tower searchlight will be supplied with current from the power house of the Niagara Falls Hydraulic Power & Manufacturing Company, and the light from this projector will be observed more than 50 miles away, but it is believed on account of the great height of the tower that the Exposition, which is 22 miles away, is easily within its range.

Its powerful rays will be met by those of two 30" projectors on the Electric Tower at a height of 350 feet from the ground. These searchlights will require a current of from 75 to 100 amperes at a potential of about 50 volts. These powerful beams of light from the tower will illuminate the various groups of statuary about the grounds, and give the visitor a bird's-eye view of the Pan-American Midway from the tower.

The many features on the Midway utilizing

electricity extensively in their various effects, are the "Trip to the Moon," "Darkness and Dawn," "House Upside Down," "Dreamland," "Hawaiian Volcano," and the "Aerio Cycle." What the Ferris Wheel was to the Chicago Exposition, the "Aerio Cycle" will be to the Pan-American Exposition. It is the altitudinous wonder of the Midway. At each end of a structural iron beam, which in operation is remindful of the "teeter" of boyhood, is a revolving wheel in which four cars are hung after the manner of the Ferris Wheel. These cars are operated by 40 horse power electric motors. When one wheel is down taking on and discharging passengers, the other is revolving 275 feet in the air. Two powerful searchlights will be used from the axis of each wheel, while the "Aerio Cycle" will be illuminated by more than 2,000 incandescent lamps operated by current from Niagara.

The electric launches will be operated as in Chicago from the concession "Venice in America," while the other features above referred to will use electric projectors, chasers, electric

plates of glass. The discharges are varied up to 250 per second.

The line potential has been raised from 11,000 volts to 22,000 volts, and many of the static step-down transformers are already in position in the Electricity Building for converting the high tension Niagara Falls current to a moderate tension for distribution about the grounds and to the various buildings. The Electricity Building has been ready for exhibitors for some time past, as well as the Machinery and Transportation Building and others in different parts of the grounds. Little fear is entertained by the officials but that the opening and dedication exercises will occur as scheduled.

TRAIN LIGHTING BY ELECTRICITY.*

BY PROF. GEO. D. SHEPARDSON.

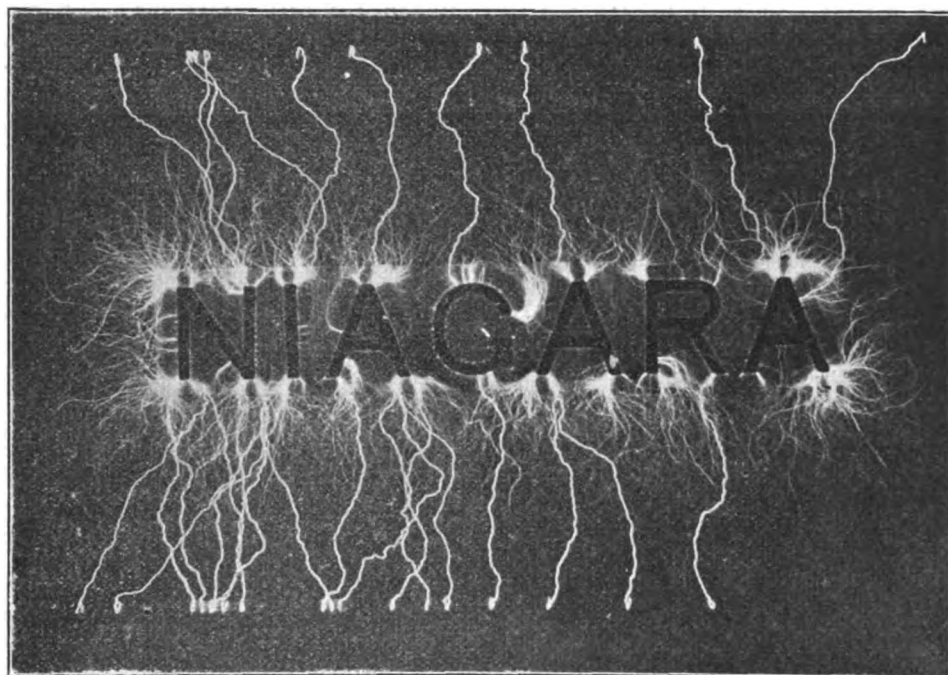
Attention may be given to the various parts of the axle-lighting systems, noting how different engineers have attacked the difficult problem. The mechanical connection between the car axle and the dynamo is a much simpler

car axle and geared to it by a 41 reduction gearing. A somewhat similar arrangement was used for a while by the American Railway Electric Light Company in 1897, who fitted a split sleeve over the car axle, to carry the gear and dynamo journals. The first equipment put out by Moskowitz, in 1893, on the Central Railway of New Jersey, had a sprocket wheel on the car axle, from which a chain drove a countershaft with a cone pulley driving the dynamo, which was in one corner of the baggage car. The sprocket was abandoned and the dynamo was then mounted on the car truck with a friction drive, which in turn was replaced by a belt drive with countershaft hung with tension springs. With any kind of a belt drive it is necessary to use wide flanged pulleys on account of the up-and-down and endwise motion of the car axle and on account of the swinging of the truck in rounding curves. In the Stone system, largely used in England and Europe, and in its American representative, the Gould system, the dynamo is hung on the car body with links and tension springs. The system put out by the Consolidated Railway, Electric Light & Equipment Company, which has consolidated the Moskowitz interests. National Electric Axle Light Company, the Electric Axle Light & Power Company, the Columbia Car Lighting Company and the United Electric Company, uses a peculiar belt with V-shaped links working in grooved pulleys, the dynamo being mounted on the car truck with a spring tension device.

To protect the axle-lighting outfits from the weather, the dynamo is generally made iron clad and weatherproof, so that externally it looks like a tight box. The difficult part to protect is the belt, or gearing; in the case of a dynamo hung on the axle, the gears or friction drive may be inclosed in a dust and oil tight metallic casing, as is common on street railways. Where a belt is used, some sort of flexible casing is desirable. The batteries are placed in boxes hung under the car body, having removable fronts, and having suitable ventilating openings for the escape of the gases which arise during the charging of the batteries.

The regulation of the voltage with the varying speeds is one of the most difficult problems to handle. One method of keeping the voltage at the lamps constant while the speed of the train varies, is to secure a variable ratio of reduction between the car axle and dynamo. Below a certain limit of speed of train it is impossible with any system to maintain proper operation of the dynamo, and some automatic device must be provided to cut the dynamo from the battery and lamp circuit below the critical speed. Above this speed the dynamo may be kept at constant speed by means of friction cone pulleys, as was done by Barrett and by Moskowitz. The plan of Stone, in England, and of Gould, in America, is to maintain the speed constant by allowing the belt to slip; if the speed of the dynamo increases, the voltage also increases, and this makes the current through the battery or lamps increase correspondingly, but the pull on the belt is closely proportional to the current from the dynamo armature, hence the higher speed of the dynamo involves a greater pull on the belt; now, it is not difficult to adjust the tension of the belt so that it will slip more or less and pull the armature just hard enough to deliver the desired current and no more.

A more common method of securing constant



HIGH POTENTIAL WORK AT THE PAN-AMERICAN EXPOSITION.

stereopticons, and numerous motors, fans and focusing arcs in producing the mysterious sensations on the airship "Luna," in the City of the Moon, the caverns and grottos in the representation of "Dante's Inferno" revised and up to date.

Probably the effects produced in "The Johnstown Flood," "The Hawaiian Volcano," and "Hell up to Date," could not have been made so effective without the present high tension current now available, and the storm, thunder and lightning effects would not be possible.

One of the most interesting and startling features at the Exposition will be the high-tension experiments produced by Mr. C. E. Skinner of the Westinghouse Electric & Manufacturing Company, and Mr. Paul M. Lincoln, superintendent of the Niagara Falls Power Company. The enormous pressure of 40,000 volts is required to produce the most brilliant effects in their demonstration, which produces a wonderful imitation of a thunderstorm with lightning effects, which are truly wonderful. The accompanying illustrations show a few of the effects produced by lettered signs of heavy

problem in Europe, with rigid car basis, than in America, with four or six-wheel swiveled trucks. In Europe, it is usual to mount the dynamo on the car body, for the car axle is always practically at right angles to it. The power is generally transmitted by means of flat belts of link or solid leather, or of camel's hair. On one car of the Paris, Lyons and Mediterranean road the pulley on the end of the armature shaft was pressed against the side of one of the car wheels; then end motion of the axle was apparently too much for it, for later devices by their engineer, Auvert, use a flat belt. In the Vicarino axle lighting system, now being exploited by the Pollak Battery Company of Frankfurt, Germany, the power transmitted by a friction drive, a flat-faced pulley on the armature being pressed against a larger flat-faced pulley on the car axle. This is similar to the drive used for some time in the Moskowitz system, and abandoned for a belt drive. The Dick system uses a dynamo made like a regular street car motor, hung upon the

*Abstract of a paper presented at the March meeting of the St. Louis Railway Club.

output from the dynamo is to let the speed vary with that of the car, and to change the strength of the magnetic field, or the effective number of armature wires to compensate any changes in speed. It is practicable to change the effective number of armature wires only within narrow limits, and, so far as the writer knows, this has been adopted only on the Brush dynamos used in the early work of Stroudley and Houghton in England. The regulation by changing the strength of the magnetic field has been used more generally. The method adopted by the Consolidated Railway, Electric Lighting & Equipment Company is to have a small motor connected with the adjustable arm of a resistance box and governed by a magnet in the main circuit; this motor automatically adjusts the resistance in series with the shunt field coil, so as to strengthen or weaken the magnetic field to compensate for any changes in speed above the critical speed of about 15 miles per hour. Personal observation of the working of this device on the Santa Fé road last December showed that, after the dynamo was connected with the lights, a sensitive Weston voltmeter indicated no perceptible variation of voltage between 15 miles and the highest speed attained, probably 40 miles per hour. In a few cars there was a slight but gradual change at the critical speed when the lights were shifted from the dynamo to the battery or vice versa. In no case was the fluctuation objectionable, and it was probably not noticed by the passengers.

One of the earliest forms of this regulator was used experimentally on a Boston & Albany car about 1897. In the Dick system the resistance is regulated by an electro-magnet. Another method of regulation is that formerly used by Moskowitz, and now used by Vicarino in Europe, namely, a differential winding on the dynamo field magnet. This carries two sets of coils, one a shunt field, such as used by the systems already noted, and in addition to this, a second coil of large wire through which the main current passes. As the car and dynamo run faster, the voltage tends to rise correspondingly, and, consequently, the current delivered to the lamps and batteries increases, but the current passing through the series coil weakens the magnetic field and so tends to offset the higher speed. There are numerous technical difficulties in the design of such a dynamo, but by careful adjustment the voltage at the lamps may be kept constantly within a narrow range. A test on the Vicarino system showed a variation from 31.0 to 31.8 volts as the train speed rose from 50 to 100 kilometers (31 to 62 miles) per hour, certainly a close regulation.

A source of difficulty in any system using a storage battery is that the voltage gradually drops off as the battery discharges. In large central stations this is compensated for by an end cell switch, which cuts in more cells as the voltage falls off. This is too much complication for train service. It is found, however, that if the number of lamps burning is diminished as the battery discharges, the voltage remains practically constant and the regulation is close enough. It naturally takes more voltage to charge a battery than it delivers, and when the battery is charged and discharged intermittently, being connected with the lamps at the same time, it is necessary to protect the lamps by a resistance which cuts down their voltage to the proper amount. This method is adopted in all axle-lighting sys-

tems. The adjustment of the series resistance involves some technical difficulties which need not be dwelt upon, but which yield to care in adjusting the equipment to the regular run of the car.

The devices for maintaining the proper polarity of the dynamo and for cutting it in or out as the critical speed is passed, are partly mechanical and partly electrical, the details of which would extend this paper, already too long, far beyond the limits of your patience. Whatever may be said of some of the older systems which appeared from time to time, there are at present at least four systems in Europe and two in America which seem to have reached the practical and reliable stage, and it is now possible to obtain axle lighting equipments even on rental basis at no greater cost than gas, with strong guarantees of perfect service backed by ample capital.

Death of Prof. Henry A. Rowland.

Henry A. Rowland, professor of physics in Johns Hopkins University at Baltimore, Md., died April 16. He was the son of the Rev. H. A. Rowland, and was born in Honesdale, Pa., in 1848, and was graduated as a civil engineer at the Rensselaer Polytechnic Institute in 1870. His earliest professional work was on a railroad survey.

In 1881 he was a member of the Electrical Congress in Paris, and was one of the jurors in the electrical exhibition in that city, being appointed a member of the Legion of Honor in recognition of his services. For many years Prof. Rowland had enjoyed an international reputation. He was a permanent member of the International Commission for establishing electrical units, was a corresponding member of the British Association and of the London Physical Society, and was intimately connected with scientific associations all over the world.

His original investigations were on a most comprehensive scale, and resulted in a vast number of electrical and optical discoveries and improvements.

New York Electrical Society.

The 214th meeting of the Society will be held at Havemeyer Hall, Columbia University, Thursday, April 25, at 8 p.m. Mr. C. F. Scott, chief electrician of the Westinghouse Electric & Manufacturing Company, will lecture on "Alternating Current Motors." The subject will be treated with special reference to the operation of motors rather than their theory and design. The characteristics of different types of alternating motors will be explained, and particular attention will be directed to the induction motor. The leading points of different forms of induction motors will be brought out, and the adaptation of these forms to different classes of service will be set forth. The motors will be on exhibition; performance curves will be shown, and lantern slides will illustrate various induction motors, together with their controlling devices. Other illustrations will show the motors in varied application. Experiments will also be given to illustrate the rotating magnetic field, which is the principle on which the motors depend for their operation. This lecture will embody a fund of valuable information never before made available to the public.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended April 10:

Antwerp, 15 packages, \$546; Argentine Republic, 133 cases, \$6,569; 3 cases motor vehicles, \$1,850; 18 packages, \$4,121; Brazil, 232 packages, \$44,203; 1 coil cable, \$105; Bremen, 1 package, \$75; British East Indies, 3 cases, \$158; British Possessions in Africa, 39 packages, \$2,180; British West Indies, 13 packages, \$454; Bristol, 6 packages, \$2,030; Bolivia, 9 packages, \$160; Canada, 20 cases, \$180; Central America, 68 packages, \$2,409; 1 case, \$270; Chili, 1 case, \$12; Cuba, 413 packages, \$2,299; 1 reel cable, \$137; Dundee, 5 packages, \$520; Ecuador, 82 packages, \$1,476; Glasgow, 1 case, \$100; Hamburg, 28 packages, \$2,142; 8 packages motor vehicles and parts, \$5,000; Havre, 7 packages, \$100; 1 case motor vehicles, \$600; Hayti, 9 packages, \$149; Huddersfield, 2 cases, \$32; Liverpool, 200 packages, \$22,229; 5 packages motor trucks, \$325; London, 197 packages, \$3,392; 5 cases motor vehicles and parts, \$3,820; Marseilles, 8 cases, \$587; Mexico, 71 packages, \$1,312; Newcastle, 27 packages, \$3,515; New Zealand, 2 packages, \$16; Peru, 16 cases, \$825; Preston, 3 cases, \$157; Ramsgate, 2 cases, \$200; Rotterdam, 1 crate motor vehicles, \$150; Siam, 34 packages, \$11,212; Southampton, 10 packages, \$2,409; 6 cases motor vehicles, \$3,000; U. S. Colombia, 7 packages, \$453; Venezuela, 140 packages, \$1,046; Vienna, 16 packages, \$792.

The following are the exports of electrical material, from the port of New York, for the week ended April 17:

Alicante, 8 cases, \$274; Antwerp, 16 cases, \$1,401; Argentine Republic, 72 cases \$2,125; Australia, 658 packages, \$47,603; 6 packages motor vehicles, \$5,050; British East Indies, 32 cases, \$1,051; 42 packages, \$10,525; British West Indies, 26 cases, \$662; 1 case motors, \$17; Central America, 236 packages, \$4,982; Chili, 1 package, \$11; China, 74 packages, \$2,451; Cuba, 263 cases, \$3,233; 4 barrels, \$195; Dunkirk, 8 cases, \$1,077; Ecuador, 1 package, \$57; Genoa, 137 cases, \$9,776; Glasgow, 109 packages, \$18,463; 81 reels cable, \$24,311; Hamburg, 32 packages, \$6,433; Havre, 71 packages, \$3,029; Japan, 73 cases, \$3,497; 781 packages, \$22,156; Liverpool, 135 packages, \$18,899; London, 291 packages, \$9,597; Marseilles, 9 cases, \$363; Mexico, 67 cases, \$2,170; 46 packages, \$10,063; Milan, 8 packages, \$992; Newcastle, 80 cases, \$9,700; New Foundland, 1 package, \$35; Nova Scotia, 5 packages, \$137; Nice, 1 case, \$50; Odessa, 4 cases, \$40; Peru, 5 packages, \$124; Philippines, 45 packages, \$4,396; Southampton, 19 cases, \$1,749; Uruguay, 8 cases, \$180; U. S. Colombia, 105 packages, \$1,406; Vienna, 56 packages, \$2,058.

Lundell Power Apparatus Selected.

The new large machine shops being erected at Elizabethport, N. J., for the Central Railroad of New Jersey, for which Mr. George Hill is consulting engineer, will be equipped exclusively with the well known Lundell power apparatus manufactured by the Sprague Electric Company. The equipment will consist of three 100 kw. generators of 240 volts and 250 r.p.m., direct connected to Ball & Wood engines, and 75 motors of various sizes for driving the machine tools. The Lundell generators and motors have long had the distinction of being of the very highest degree of ex-

cellen in the qualities pertaining to efficiency, durability and mechanical construction. All of the motors and one generator are booked for delivery in June and the other two generators will be delivered in July.

Extending Its Business.

The Thresher Electric Company of Dayton, O., has been incorporated under the laws of the State of West Virginia, with an authorized capital of \$600,000, for the manufacture and sale of all kinds of electrical machinery and appliances.

This corporation succeeds the company of the same name of which Mr. Alfred A. Thresher has been the sole proprietor and which he has incorporated for the purpose of providing more ample facilities for conducting the large and growing business which has been built up during the past eight years under his individual management.

Mr. Thresher is a member of the American Institute of Electrical Engineers, of the Franklin Institute of Philadelphia, an associate member of the Society of Naval Architects and Marine Engineers and a graduate of Denison University, where he obtained a thorough grounding in the principles of higher mathematics which are essential to a complete mastery of his chosen calling of an electrical engineer. After graduation he spent more than a year abroad in travel and observation and soon after his return established the business which he has prosecuted to the present time overcoming all the obstacles incident to a new enterprise with persistent energy and determination and with single ability.

In thus adding a leading branch of one of the most prominent of modern industries to the list of Dayton's successful manufacturing enterprises, it has been the aim of Mr. Thresher in addition to obtaining the discipline and knowledge of details, requisite to the conduct of any successful business, to also gain such a grasp of practical mechanical knowledge as well as a personal acquaintance with the requirements of purchasers as would fit him to design and construct the highest grade of electrical machinery.

In entering upon the general market, the Thresher Electric Company offers a complete line of direct current apparatus for electric railways, lighting and power transmission, and has placed its outfit at the head of the list as against all competition on three special lines. First, generators, both direct connected and belted, of the most approved design, exact in regulation under all degrees of load and economical in operation; second, a complete system of motors for the transmission and application of electrical power to the varied requirements of industrial uses, including an entirely inclosed type giving very high efficiency combined with complete protection; third, marine generating sets, of highest efficiency, designed to meet the severe requirements of the Government naval service.

Plans are being prepared for extensive shops with a complete equipment, affording the most approved facilities for manufacturing and testing.

Meeting of Municipal Electricians.

President Morris Mead of the International Association of Municipal Electricians has called a meeting of the executive committee of that body, to be held at Niagara Falls, N. Y., April 27.

PERSONAL MENTION.

Mr. Frederick P. Fish was recently elected a director of the American Bell Telephone Company and of the American Telephone & Telegraph Company. He has accepted the position of president of these companies and will take office July 1.

Prof. A. B. Clemens has been appointed principal of the School of Mechanical Engineering of the International Correspondence Schools, Scranton, Pa.

Mr. S. R. Smith, formerly a resident of Watertown, N. Y., has accepted the position of general manager of the Cincinnati, Columbus & Southern Railway, an electric line 100 miles long, with Cincinnati and Columbus as the terminals.

Mr. Frank J. Bazak, formerly superintendent of maintenance of the Detroit Telephone Company, has been appointed superintendent and consulting engineer of the Seattle, Wash., Telephone Company.

INCORPORATIONS.

The Wayne County Electrical Company, Lyons, N. Y. Capital stock, \$100,000.

The Citizens' Electric Light & Power Company, Elyria, O. Capital stock, \$20,000.

The Strasburgh Electric Company, Strasburgh, O. Capital stock, \$10,000. Incorporators: T. Kemp, E. P. Hopitzky and E. R. Carver.

The Hixley Electrical Company, Columbus, O. Capital stock, \$1,000. Incorporators: M. A. Pixley, C. F. Pryor and H. W. Webb.

The Frenchtown Electric Construction & Maintenance Company, Frenchtown, N. J. to supply light, heat and power. Capital stock, \$50,000.

The Monarch Electric & Wire Company, Chicago, Ill. Capital stock, \$25,000. Incorporators: Samuel J. Howe, Ralph R. Keller and Mark C. Keller.

The Dayton & Richmond Traction Company, Indianapolis, Ind. Capital stock, \$10,000. Directors: A. C. McDonald, H. G. Cress, C. J. Hall, William Ammon and D. T. Baker.

The Joy Printing Telegraph Company, New York City. Capital stock, \$80,000. Directors: O. J. Smith, Dobbs Ferry; G. W. Cummings and J. H. Grant New York City.

The Los Angeles & Pasadena Electric Railway Company, Los Angeles, Cal. Capital stock, \$1,000,000. Incorporators: A. McNally, D. Dewey, J. W. Hughes, P. M. Green, F. C. Bolt and others.

The Universal Wireless Telegraph Company, Pierre, S. D. Capital stock, \$20,000,000. Incorporators: J. N. Huston, Thomas B. Bishop and L. C. Smith.

The Prismatic Electric Sign Company, Syracuse, N. Y. Capital stock, \$4,000. Directors: F. C. Sherman and Emma O. Sherman, Syracuse, and Harry Hill, Williamsport, Pa.

The Leok's Company, New York City—to carry on the business of the supplies of light, heat and power, with gas and electricity, and to act as carriers of passengers and goods by land and water. Capital stock, \$200,000. Incorporators: Alfred George Brown, Edward B. Hawkins and Edward T. Magoffin.

The East Jersey Light & Power Company, Jersey City, N. J.—to manufacture electricity for light, heat and power. Capital stock, \$250,000. Incorporators: A. M. Reid, B. F. Freeze and Frank Bill, of New York; George Holmes, of Jersey City.

The Arcadia Electric Light, Telephone & Ice Company, Arcadia, Fla. Capital stock, \$20,000. Officers: President, J. J. Heard; vice president, C. C. Chollar; secretary and treasurer, J. L. Jones.

The Beresford Milling & Electric Company, Beresford, S. D. Capital stock, \$20,000. Incorporators: L. N. Crill, William A. Frild and Louis Wagner.

The North Georgia Electric Company, Dahlonega, Ga. to conduct a general electrical business, construct waterworks, etc. Capital stock, \$50,000. Incorporators: A. J. Warner, W. A. Carlisle, of Marietta, O., and J. F. Moore.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED APRIL 16, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

672,276. Automatic Fender for Street Cars. Wilhelm Maek, Hanover, Germany. Filed July 21, 1900.

672,319. Insulator for Conduit Electric Railways. John M. Fadie, Alexander Stevens and Romeo P. Tomassek, New York City. Filed Aug. 2, 1900.

672,335. Trolley-Pole Attachment. Willard P. Smith, Brooklyn, N. Y. Filed Feb. 20, 1901.

672,387. Electrical Connector. Thomas J. McTighe, New York City. Filed Feb. 6, 1901.

ELECTRIC LIGHTS AND APPLIANCES.

672,019. Electric Incandescent Lamp. Alf Sinding-Larsen, Fredriksvaern, Norway. Filed Oct. 2, 1899.

672,032. Arc Lamp Carbon. Herbert A. Couchman, Burton-on-Trent, Eng. Filed March 7, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

670,015. Automatic Switch for Groups of Transformers. Alfred Schlatter, Buda Pesth, Austria-Hungary. Filed Oct. 5, 1900.

672,017. Electric Igniter for Gas Engines. Luther J. Severson and Louis D. Cond, Constantine, Mich. Filed June 29, 1900.

672,020. Electric Generator. George A. Burwell, Plattsburg, N. Y. Filed Jan. 17, 1901.

672,048. Static Machine. Henry E. Waite, New York City. Filed March 8, 1901.

672,201. Carbon-Sorting Machine. Mahlon M. Zellers, Cleveland, O., assignor to the National Carbon Company, Trenton, N. J. Filed Sept. 5, 1899.

672,232. Construction of Armatures and Inductors for Dynamo-Electric Machines or Motors. Oskar Lasche, Berlin, Germany. Filed Feb. 4, 1901.

672,268. Electric Chain Link-Welding Machine. Eugene F. Giraud, Doulaingourt, France. Filed Feb. 12, 1900.

672,332. Sparking Igniter for Explosive-Engines. William Roche, Jersey City, N. J. Filed Nov. 20, 1900.

672,411. Electrical Igniter for Explosive Engines. Madison F. Bates, Lansing, Mich. Filed Dec. 1, 1899.

672,419. Means for Controlling Electric Motors. Frederic A. Johnson, Binghamton, N. Y., assignor to the Stow Manufacturing Company, same place. Filed Jan. 15, 1901.

TELEPHONES AND TELEPHONE APPARATUS.

672,035. Toll-Collecting Machine for Telephones. William A. Foss, Cleveland, O., assignor to the American Toll Telephone Company, same place. Filed Sept. 17, 1900.

672,064. Telephone Metering System. Newman H. Holland, Brookline, Mass., assignor to the Automatic Telephone Motor Company of New Jersey. Filed Nov. 27, 1899.

672,122. Appliance for Telephone Switchboards. William W. Dean, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Dec. 8, 1899.

672,327. Switch for Telephone Exchanges. Frank A. Lundquist, Chicago, Ill., assignor to M. E. Richardson, trustee, Sterling, Kan. Filed Jan. 22, 1900.

672,388. Holder for Telephone Receivers. Ceibert H. Newhall, Philadelphia, Pa. Filed Jan. 14, 1901.

672,406. Combined Desk-Telephone and Switch-Stand for Interconnecting Telephone Lines. Hermann Herbstritt, San Francisco, Cal., assignor to the Automatic Interconnecting Telephone Company, same place. Filed Feb. 12, 1900. Renewed Sept. 17, 1900.

MISCELLANEOUS.

672,030. Motor Vehicle. Daniel T. Clark, Cleveland, O. Filed Oct. 8, 1900.

672,047. Electrode. Henry E. Waite, New York City. Filed Feb. 16, 1901.

672,054. Electric Crucible Furnace. Guillaume de Chalmot, Holcomb's Rock, Va., assignor to the Wilson Aluminum Company, New York City. Filed Sept. 5, 1899.

672,067. Electric Furnace. Francis J. Patten, New York City. Filed June 16, 1900.

672,071. Fireproof Insulating-Duct. Horace N. Speer and Edward D. Speer, New York City, assignors to the Security Conduit Company, same place. Filed Sept. 8, 1900.

672,074. Apparatus for Electrical Laundrying. George D. Burton, Boston, Mass. Filed June 27, 1898.

672,168. Telegraph Sounder. William A. Hudson, Washington, D. C., assignor to James Edgar Smith, same place. Filed Dec. 29, 1900.

672,184. Photometer. Ernest W. Cushing, Boston, Mass., assignor to the Eastern Electric Company, same place. Filed July 13, 1900.

672,191. Voltaic Cell. Washington H. Lawrence, Cleveland, O., assignor to the National Carbon Company, same place. Filed Oct. 9, 1897.

672,219. Electric Battery. Arthur L. Stevens, New York City. Filed May 28, 1900.

672,236. Electrical Resistance With Small Heating Capacity. Karl Ochs, Berlin, Germany, assignor to the Allgemeine Elektrizitäts Gesellschaft, same place. Filed Sept. 16, 1899.

672,243. Electrical Card Punching Apparatus for the Production of Jacquard-Cards. Jan Szczepanik, Vienna, Austria-Hungary. Filed Feb. 16, 1899.

672,246. Electric Fire-Alarm System. Fulton Gardner, Chicago, Ill. Filed July 28, 1900.

672,263. Supporting Device for Electric Fans, etc. Louis N. D. Williams, Ashbourne, Pa., assignor of one-half to Robert W. Scott, Philadelphia, Pa. Filed July 26, 1899.

THE TELEPHONE WORLD.

Independent Telephone Association Convention.

Through the efforts of the Queen City Telephone Company, now seeking a franchise in Buffalo, N. Y., the convention of the Independent Telephone Association of the United States will be held in that city this summer.

The association is made up of about 1,000 telephone companies, and there will be about 1,000 delegates in attendance at the convention, which will be held during the second week in June.

The Kansas State board of telegraph and telephone assessors has fixed the price at which the property of the companies in that State will be assessed this year. The new schedule of valuation agreed upon is a reduction from the valuation of last year of about 8 per cent. Telegraph poles and wire are assessed at \$65 per mile for first wire and \$10 per mile for each additional wire. First class telephone toll lines are assessed at \$40 for poles and first line and \$6 for each additional wire. First class telephone exchanges will pay taxes on valuation of \$175 for each pole, \$5 for each mile of wire, and \$5 for each instrument. Second class telephone companies using copper wire will pay on valuation of \$24 per mile for poles and wires and \$6 on each additional wire. Instruments of second class exchanges are valued at \$5 each, which is a raise of \$2 over valuation of last year. Third class exchanges will pay on valuation of 75 cents for each pole and \$2 per mile for iron wire and \$6 for copper wire. Instruments are assessed at \$4 each, which is a raise of \$1 over last year.

The Glen Telephone Company is about ready to commence operations in the cities of Johnstown and Gloversville, N. Y., with over 1,000 subscribers. It has been decided to give local investors opportunity to subscribe for the stock of this corporation. The company is incorporated with a capital stock of \$100,000, divided into shares of \$100 each. Subscriptions are invited to the stock at par for a limited time only.

It is reported from a reliable source that an independent company will be organized to construct a new telephone system between towns and villages in the locality of Kingsport, Tenn., and extending south to Washington County. The parties named in connection with the project have resources to operate the exchange.

The stockholders of the Overton Telephone Company met at Livingston, Tenn., a short time ago, and a complete reorganization of the company was effected, the capital stock being increased from \$5,000 to \$25,000. The company expects to construct 300 miles of telephone line within the next twelve months. The new company will put an exchange in Cookeville at once.

A war has been raging in Browning, Mo., between the Browning telephone exchange and several of the long distance lines that come in from the country and attach to the switchboard. The difficulty arose over the exchange raising the assessments.

Maurice L. Strunberger, of Jackson, O., and other Ohio capitalists have formed a company of which he is president for the construction and operation of telephone lines. The first line will be put in operation between Jackson and Wellston, and extended to Chillicothe. Portsmouth and other points.

The New Valley Telephone Company has been granted a franchise by the South Waverly, N. Y., borough council. B. G. Hubbel, of Cleveland, president of the Century Construction Company, which will build the new line, has lately been in Waverly in the interest of the concern.

The Augusta Telephone Company has been constructing a long distance telephone line from Augusta to Leon by the way of Haverhill, Kan.

The New Citizens' Telephone Company, which is the rival to the Bell Company, has opened up its business in Terre Haute, Ind., with about 250 new telephones.

The Independent Telephone Company of Waco, Tex., will at once request a franchise to erect and operate a system in Cleburne in that State.

The Warwick Valley Electric Light & Power Company has about decided to establish a local telephone system in Warwick, N. Y.

The Diamond State Telephone Company of Dover, Del., has increased its capital stock from \$1,000 to \$250,000.

Efforts are being made to have one of the telephone systems extended to Naples, S. D.

An Alleged 'Phone Invention.

A Chicago man, it is claimed, has perfected a machine that will keep an accurate count of the calls, to the satisfaction of both the company and the subscriber. It is a small clock shaped metal box designed to stand on a desk telephone or to be attached to the framework of a box telephone, connection being made by short wires with the telephone wires.

The mode of operation is quite simple. When the subscriber calls central, he presses a button on top of the indicator, which adds one to a number seen through a glass in front, the operation being about the same as a street car register when the conductor pulls the cord. At the same time it sends a buzz over the wires to central, showing that the call has been registered.

When the company desires to take the record of the telephone the subscriber is called up and asked to press the indicator button. When this is done the record taker in the central office reduces the number shown by the indicator. The apparatus is designed to do away with and settle disputes between subscribers and telephone companies as to the number of messages sent.

Telephone men in Sioux City, Ia., have taken the preliminary steps for the organization of a club in the interests of their business. It will include in its membership the managers of the various departments, the linemen and other employees. "Its object," said Manager E. A. Clark, of the Iowa Telephone Company, "is largely for the instruction of its members in the telephone business. Regular meetings will be held, at which papers will be presented and general discussions held upon live, up-to-date subjects that are of interest to the work. The members feel that there is something to be gained by organization and study."

The following officers of the Independent Telephone Company of Binghamton, N. Y., were elected last week: President, George C. Bayless; secretary, James H. Roberts; treasurer, Thomas B. Crary. The directors decided to increase the capital stock from \$100,000 to \$150,000.

The Maryland & Delaware Telephone & Telegraph Company, which operates a telephone line on the Delaware peninsula, has been granted a permit by the Cecil County commissioners to build a telephone line in Cecil County connecting with various towns and villages. The new line will run in opposition to the Diamond State Company.

The People's Telephone Company has obtained a franchise to conduct business in Lynn, Mass., from the aldermen. For two years the company has fought to enter that city. The vote was unanimous. The company binds itself not to charge above \$18 for office and \$24 for house telephones.

The United Telegraph & Telephone Company, the incorporation which has absorbed the Schuylkill Telephone Company, now controls 25,000 phones, and will soon hold the key to communication all over middle and eastern Pennsylvania. The office of the company will be in the Fidelity Building, Philadelphia.

The telephone war in Barre, Vt., has been brought to a close by the New England Telephone & Telegraph Company signing an agreement not to raise its rates or abridge its privileges for five years.

The Southern Electric Company will shortly establish a telephone exchange in Paris, Ky., to compete with the Cumberland Company. R. E. Rice, lately with the Cumberland Company, will be manager.

The Zenith Telephone Company of Duluth, Minn., will increase its funds by an issue of \$100,000 in bonds, which will be used for extensions.

A new telephone circuit is being put in between Fulington and Milton, Vt., by the New England Telephone Company.

The La Crosse, Wis., Telephone Company is stringing an overhead cable to satisfy the needs of its patrons until the underground cable is laid.

A telephone line between Murdock and Carlson, Minn., is projected and will probably be built this spring.

The Star Telephone Company of Ashland, O., has increased its capital stock from 50,000 to \$100,000.

A telephone company has been organized for the purpose of extending a line from Rolling Stone to Minnieska, Minn.

News from Williamsport, Pa., states that General Superintendent Henry Lewis, of the North and West Branch Telephone Company, says the new telephone company has all ready secured 700 subscribers, and is putting in an average of 50 new telephones per week. Work on the out of town connections is progressing rapidly. The eastern connection will be made at Dewart, and a gang of linemen will put up poles as far as Montoursville. The western connection will be made at Jersey Shore.

The Camden Telephone Company of Elizabeth City, N. C., and the Portsmouth & Cornland Telephone Company of Virginia are at work completing a long distance telephone line between these two ports. The line is already completed from Elizabeth City to South Mills, on the Dismal Swamp Canal, and also from Norfolk to Wallaceton, Va. The work of erecting the poles and wires on the canal from Wallaceton to South Mills is now progressing rapidly and the line will be open for communication in about sixty days, giving long distance service with Norfolk, and all points north and west.

The Empire State Telephone Company has refused to let the Sodus, N. Y., Local Telephone Exchange Company place its switchboard in the office where it was last year. This means that the Sodus company will be put to considerable expense in locating another place for its switchboard, as all the wires and several poles will have to be removed. The feeling between the two companies is very bitter. The Sodus company has in the neighborhood of 30 members, and the Empire Company about half as many.

The annual meeting of the Addison County Telephone Company was held in its office at Middlebury, Vt., and the following officers were elected: President, Allen Calhoun, of Middlebury; vice president, J. S. Dodge, of Warren; secretary and treasurer, A. T. Calhoun, of Middlebury. It was voted to expend the earnings of the company in extending the lines north and to Brandon.

Articles of incorporation have been filed with the secretary of State for the Story City, Ia., Telephone Company with a capital of \$10,000. A. M. Henderson is president; J. E. Cowin, vice president; W. A. Devendorf, secretary and Joseph Marvick, treasurer.

Two copper wires are being strung by the New England Telephone & Telegraph Company between Montpelier, Vt., and Boston. The wires can be used for either telephone or telegraph instruments.

J. M. Smith, who has the contract to construct the telephone line from Liberty to Wallisville, Tex., will extend the line to Turtle Bayou, Aarhuac, Graydon and Double Bayou at an early date.

The New York & New Jersey Telephone Company is to open a new exchange at Far Rockaway, N. Y., on May 1. There are over 400 telephone subscribers at that place and Rockaway Beach.

The Home Telephone Company has secured a franchise to establish a telephone system in the village of Lewiston, N. Y.

An independent telephone exchange with much lower rates may be established in Brattleboro, Vt.

TELEPHONE INCORPORATIONS.

The Madison-Clarke Telephone Company, London, O., capital stock, \$50,000.

The Carmel Mutual Telephone Company, Carmel, Ind., capital stock, \$5,000.

The Markleville & Emporia Telephone Company of Henry and Madison Counties, Markleville, Ind., capital stock, \$2,000.

The Maxwell Telephone Company, Maxwell, Ia., capital stock, \$10,000. E. N. Addin is president and J. O. Tenet is vice president.

The Parkersburg Telephone Company, Parkersburg, Ia., capital stock, \$10,000. Incorporators: G. G. Bickely, C. F. Bennett, John Secherling, H. W. Wilhelms and Robert E. Camp.

The Elbow Lake Telephone Company, Elbow Lake, Minn., capital stock, \$10,000. Incorporators: Henry Sampson, E. J. Scofield, T. E. Dybdel, F. V. Barnes and W. E. Lanleene.

The Southern Telephone Company, Lake Creek, Tex., capital stock, \$4,000. Incorporators: E. M. Reed, S. P. Buckler and J. A. Akard.

The Williamsburg Telephone Company, Williamsburg, Ia., capital stock, \$10,000. Incorporators: A. C. Moore, T. T. Osborne, H. H. Hull, John P. Doherty, M. J. Kelly and G. H. Hughes.

GENERAL ELECTRICAL NEWS.

Lighting.

Alexandria, Va.—It is proposed to enlarge the city's electric light plant at a cost of \$20,000.

Black Creek, N. C.—The citizens of this place have decided to put in an electric light plant.

Charlotte, N. C.—The Alpha Mills will install an electric light plant.

Chatham, N. J.—The citizens will vote on May 14 on the question of issuing \$15,000 electric light bonds.

Church's Ferry, N. D.—S. Hahn of this city is figuring on putting in an electric light plant at Minnewaukon.

Clarinda, Ia.—A business men's association was organized here a short time ago whose object is to secure in some way, and soon, an electric light plant, an improved waterworks system, street paving, etc.

Collinsville, Conn.—E. A. Perkins, of the Perkins Electric Light Company, has been here looking over the ground preparatory to installing an electric light system.

Crestline, O.—The electric light plant here was sold at sheriff's sale recently. It was bought by the First National Bank of Crestline and John A. Roebing Sons Co. of Trenton, N. J. The price paid was \$16,067. The plant will continue in operation.

Dayton, Wash.—An ordinance will soon be introduced calling for a special election to vote on the question of bonding the city for \$30,000 for either purchasing the present electric light plant from A. Roth or building a new plant.

East Jordan, Mich.—The common council has granted a 10-year franchise for electric lighting in the village to W. A. Loveday.

Egg Harbor City, N. J.—The power house of the Egg Harbor City Electric Light plant was totally destroyed by fire April 19. The loss is about \$10,000.

Excelsior, Minn.—At a recent election it was voted to grant a franchise for 20 years for an electric light plant to Thiss & Strong of Minneapolis.

Fort Gaines, Ga.—The Fort Gaines Mill & Power Company is in the market for electrical machinery and supplies, including a 500 light plant and one or two new water wheels.

Fremont, Ind.—This town will build its own electric light plant.

Granite Falls, Minn.—This city has voted to issue \$6,000 in bonds for the purpose of improving the electric light plant.

Greenville, S. C.—The Monahan Cotton Mills will install an electric light plant.

Homer, Ill.—G. Bowen is preparing to erect an electric light power house at this place.

Hubbard, O.—The municipal electric light plant here was burned recently. The loss is estimated at \$7,500.

Independence, Kan.—Walter Sickles, secretary of the Commercial Club, says we need some manufacturing industries, notably a cotton mill, also a cannery and an electric light plant.

Jackson, Tenn.—An electric light plant will be built here at a cost of \$12,000.

Laurel, Md.—This city will need electric light machinery soon. Address Ed. Phelps, mayor.

Maysville, Mo.—Messrs. Thompson & Mays of Platte County are here making arrangements to build an electric light plant.

Moro, Ore.—The question of erecting an electric light plant is being agitated here.

Orlando, Fla.—The question of erecting an electric light plant is being agitated by citizens of this place.

Portsmouth, N. H.—The new management of the Portsmouth Gas, Electric Light & Power Company intends to expend about \$500,000 in perfecting the plant, and the work will commence about May 1.

Roanoke, Ala.—The city council is laying plans for an electric light plant.

Saugerties, N. Y.—This place is soon to be lighted by electricity.

Scottsburg, Ind.—The citizens of this place are agitating the question of erecting an electric light plant.

Seaford, Del.—It has been decided to bond this town to build an electric light plant.

Terre Haute, Ind.—The L. B. Root Company has under contemplation the operation of an independent electric light plant of sufficient capacity for lighting its own store and other buildings in the vicinity.

Tullahoma, Tenn.—The Tullahoma Electric Light Company's plant was lately sold to G. W. Stegall.

Two Rivers, Wis.—A franchise has been granted Chicago parties for the construction of an electric light and waterworks plant at this place.

Winchester, Tenn.—Winchester will issue \$30,000 in bonds for the erection of an electric light plant. Address D. Taylor, clerk.

Street Railways.

Augusta, Ga.—A commission has been issued to the North Augusta Electric & Improvement Company, which proposes to build up the Hamburg territory in Aiken County, S. C., just across the Savannah River from Augusta, Ga. The amount of capital stock is to be \$1,500,000. One of the improvements alleged to be projected is an electric car line from Augusta to Aiken, the winter resort of New York society people.

Birmingham, Ala.—A recent fire turned the car barn of the Birmingham Railway, Light & Power Company, together with 40 electric cars.

Colorado Springs, Col.—Colorado Springs, Denver and Pueblo will be joined by a trolley line to cost \$2,500,000. It will be built by Chicago, Detroit and Cleveland capitalists. C. W. Taylor, who represents the syndicate, has petitioned for right of way over country roads. The main power house will be built here.

Cornish, Me.—The Maine railroad commissioners have approved the articles of association of the Ossipee Valley Railroad, which has petitioned for permission to build a trolley line from Cornish to Freedom, N. H., a distance of 20 miles. Boston and northern York County capitalists are interested in the project.

Covington, Ind.—The Crawfordville Traction Company is asking for a franchise to build an electric line over two roads in Fountain County.

Doylestown, Pa.—The Doylestown & Easton Trolley Company has selected Kulp's property at Plumsteadville as a site for the erection of the new power house building.

Ensley, Ala.—Dr. J. B. Stagg and associates of Pratt City presented a petition to the city council of Ensley asking for a franchise with the privilege to operate an electric railway in this city and between here and Brookside. The proposed line is about 10 miles long, and will touch at Pratt City and Wyiam.

Fairview, O.—The commissioners of Guernsey County have granted a franchise for an electric railroad along the National road from Wheeling, W. Va., to Cambridge, O. The franchise is in the hands of J. W. Rose, of this city, and the capital is being solicited.

Ft. Madison, Ia.—Plans are being prepared for an interurban trolley line to run between this city and Nauvoo. F. C. Wood of Chicago is the promoter.

Lyons, N. Y.—The Newark Electric Railway Company was lately incorporated with a capital of \$50,000 to operate a road five miles long, connecting the Central Hudson, West Shore & Northern Central Railroads with this village and with the proposed electric line to connect Syracuse and Rochester.

Pen Mar, Pa.—It is said that the Blue Ridge Electric Railway Company, organized to build a trolley line from Waynesboro to Pen Mar resorts, expects also to build a line to Leistersburg, in which case the Hagerstown system, if extended to Leistersburg, could connect with the Waynesboro-Pen Mar line.

Sausalito, Cal.—A movement is on foot to organize a company for the construction of a trolley road from here to Fairfax, by way of San Rafael. The movement is headed by James McCue of Corte Madera.

Seguin, Tex.—The movement is well under way to connect this place and New Braunfels by an electric railway.

Shamokin, Pa.—At a recent meeting of the directors of the Shamokin-Mt. Carmel Electric Railway Com-

pany it was unanimously decided to increase the capital stock from \$500,000 to \$750,000.

Watertown, N. Y.—A company is being organized to construct a trolley line from here to Carthage, a distance of 18 miles. The road will probably be built this summer.

Manufacturing.

Boston, Mass.—The main building of the blower works of the B. F. Sturtevant Company, in the Jamaica Plain district, was burned lately, causing a loss of \$350,000; fully insured. The concern manufactured various kinds of machinery and electrical goods as well as blowers.

Chicago.—The Benjamin Electric Manufacturing Company has been organized with a capital of \$2,400. W. Clyde Jones, Keene H. Addington, and Curtis B. Camp are those interested.—The Monarch Electric & Wire Company, capitalized at \$25,000, has recently been formed for the purpose of manufacturing electric goods and supplies. Samuel J. Howe, Ralph R. Keller and Mark C. Keller are behind the enterprise.

Elkhart, Ind.—On account of increased business the Kuhlman Electric Company, manufacturers of transformers, etc., has moved into larger quarters.

Jersey City, N. J.—The International Electric Enameling Company was incorporated last week, with a capital of \$125,000, to manufacture enamel ware. J. J. Nevin, J. J. McDavitt and H. E. Knox are behind the concern.

Muskegon, Mich.—The Shaw Electric Crane Company will soon erect a large and complete factory office here.

Trenton, N. J.—Herman J. Dercune, Charles P. Sherman and George T. Eyanson, all of Philadelphia, Pa., are interested in the recently formed concern known as the Regenerative Electric Locomotive Company and capitalized at \$100,000, to manufacture electric batteries.

Power and Transmission.

Baraboo, Wis.—Papers have been filed transferring the Munger mill property and dam with franchises at Kilbourn to William Guenther and A. D. Johnson of Appleton for \$40,000. It is understood that a company is to be formed for transmission of electric power to Portage, Baraboo and Madison.

Tacoma, Wash.—The White River Power Company has filed with the county auditor notice of its intention to appropriate 2,000 cubic feet of water per second from the White River at a point about 15 miles from here. It is proposed to divert water from the river in the foothills of the Cascade Mountains and carry it by a ditch to a point in the Stuck River Valley, where it will fall over a high bluff, thus creating a large water power for the generation of electricity. The electric power will be conveyed to this city and Seattle for distribution and sale.

Automobiles.

Geneva, O.—At a recent meeting of the board of directors of the Geneva Automobile & Manufacturing Company, the executive committee was authorized to have plans and specifications prepared for an addition to the present plant of a three-story brick building.

Huntington, N. Y.—The people here have a chance to start an automobile stage route. Mr. Lancaster, representing a firm which manufactures automobiles, is interested in the project. It is claimed that a practical demonstration of the work of the machine over the proposed route would undoubtedly lead to offers of plenty of money to establish the route at once.

Toledo, O.—Negotiations have been in progress for the consolidation of the two Toledo automobile companies, but at a recent meeting complications arose and the deal was declared off. Both companies will continue to conduct their business as heretofore.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by **ELECTRICITY** from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g. gold, guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Author'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y. —Apr 22 United Traction Co. (Consolidation of the Albany and Troy City Railway.)	100	\$5,000,000	\$5,000,000	1 1/2 % Q.	108 1/2	109 1/2
Allentown Pa. —Apr 22 Allentown & Lehigh Val Traction Co.	100	4,000,000	1,500,000	—	—	15
Bridgeport, Conn. —Apr 22 Bridgeport Traction Co.	100	2,000,000	2,000,000	1 % Aug.	100	—
Baltimore Md. —Apr 22 a United Railways & Elec. Co. com.	50	24,000,000	18,000,000	—	17 1/2	17 3/4
Boston, Mass. —Apr 22 New England Street Ry. North Shore Traction Co. North Shore Traction Co. pfd. West End Street Ry. Co. com. West End Street Ry. Co. 5 % pfd. Boston Elevated R. R.	25 100 100 50 50 100	5,000,000 4,000,000 2,000,000 10,000,000 4,000,000 10,000,000	1,081,925 4,000,000 2,000,000 4,000,000 4,000,000 6,400,000	1 % Q., Jan. 15, 5 % S. A. & O. 8 % S. A. & O. 4 % S. Jan. 2 1/2 % Aug. 99.	15 85 98 114 175 1/2	16 87 88 1/2 115 176
Brooklyn N. Y. —Apr 22 Brooklyn City Ry. Brooklyn Rap. Transit Co., tr. cert. Brooklyn Heights Railroad. Brooklyn City R.R. guar. Brooklyn, Queens Co. & Sub. R.R. Coney Island & Brooklyn R.R. Kings County Elevated. Kings County Traction Co. Nassau Electric Railroad. Atlantic Avenue Railroad. Brooklyn, B. & W. E. Railroad.	100 100 100 100 100 100 100 100 100 50 50 100	2,000,000 48,000,000 200,000 12,000,000 2,000,000 2,000,000 2,000,000 4,750,000 4,500,000 6,000,000 2,000,000 1,000,000	1,928,400 48,000,000 200,000 12,000,000 2,000,000 2,000,000 2,000,000 4,750,000 4,500,000 6,000,000 2,000,000 1,000,000	— — — 3 1/2 % Q., Jan. 2 1/2 % Nov., '99. 1 % July	235 86 1/2 107 247 325 75 — — — — —	240 87 109 239 332 80 — — — — —
Buffalo N. Y. —Apr 22 Buffalo & Niagara Falls Elec. Ry. Buffalo Railway Co.	100 100	1,250,000 6,000,000	1,250,000 5,870,500	1 % Q. Dec. 99.	74 99	75 100
Columbus O. —Apr 22 Columbus Street Railroad. Columbus Street Railroad, pfd.	100 100	8,000,000 1,500,000	8,000,000 1,500,000	1 % Q. Feb.	36 92	39 98
Charleston, S. C. —Apr 22 Charleston City Ry. Co. Enterprise City R.R. Co.	50 25	100,000 1,000,000	100,000 250,000	3 % S.	— —	— —
Chicago, Ill. —Apr 22 Chicago City Ry. Co. Chicago & South Side R. T. RR. Lake Street Elevated R.R. Metropolitan West Side Elev. Ry. Met. West Side El., pfd. North Chicago Street R.R. North Chicago City Ry. South Chicago City Railway. West Chicago St. R.R. Co. Union Traction Ry. Union Traction Co.	100 100 100 100 100 100 100 100 100 100 100 100	12,000,000 10,828,800 10,000,000 15,000,000 15,000,000 10,000,000 500,000 2,000,000 20,000,000 1,250,000 2,000,000	12,000,000 10,828,800 10,000,000 7,000,000 9,000,000 6,000,000 249,900 1,608,200 13,189,000 624,900 2,000,000	3 % Q., Dec. 31, Feb 28 1900. 3 % Q., Jan. 1 1/2 % Q. Feb. 5 % S.	200 14 1/2 35 1/2 88 209 197 99 1/2 107 1/2 15 1/2 51	203 15 1/2 35 1/2 88 1/2 210 200 101 108 15 1/2 58
Cincinnati, Ohio. —Apr 22 Cincinnati Inc. Plane Ry. com. Cincinnati Inc. Plane Ry. pfd. Cincinnati, Newport & Cov. St. Ry. Cincinnati Street Ry. Co. Mt. Adams & Eden Park Inc. Ry.	50 50 100 100 50	1,000,000 150,000 8,000,000 18,000,000 2,500,000	575,000 150,000 8,500,000 14,000,000 2,200,000	— — 2 1/2 % Feb. 1 1/2 % Q., Jan. 1 1/2 % Q., Jan.	— — 75 124 1/2 126 1/2	— — 76 123 127
Cleveland, Ohio. —Apr 22 Akron, Bed. & Clev. Elec. Ry. Cleveland City Ry. Cleveland Electric Ry.	100 100 100	1,000,000 8,000,000 12,000,000	1,000,000 7,600,000 12,000,000	3 1/2 % Jan. 3 1/2 % Jan. 3 1/2 % Q., Oct.	48 102 88	50 102 1/2 88 1/2
Detroit, Mich. —Apr 22 Detroit Citizens' Street Ry. Ft. Wayne & Belle Isle Ry. Rapid Railway Co. Detroit Electric Railway. Windsor & Detroit River Ry.	100 100 100 100 100	2,000,000 1,200,000 250,000 1,000,000 250,000	1,250,000 1,200,000 250,000 1,000,000 200,000	— — — — —	100 1/2 175 90 100 110	— — — — —
Dayton O. —Apr 22 City Railway Co. City Railway Co. pfd. People's Street Railway.	100 100 100	1,500,000 600,000 1,100,000	1,470,600 600,000 1,100,000	1 1/2 % Q. 1 1/2 % Q. —	140 170 114	145 170 115

PASSENGER RAILWAYS.

NAME.	Par	Author'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn. —Apr 22 Hartford Street Ry. Co. Hartford & West Hartford RR.	100 100	\$4,000,000 1,000,000	\$200,000 247,000	3 % A., Oct.	150 —	— —
Holyoke Mass. —Apr 22 Holyoke Street Ry. Co.	100	400,000	400,000	4 % A., June	207 1/2	212
Hoboken N. J. —Apr 22 North Hudson Co. (N. J.) Ry. Co.	25	1,250,000	1,000,000	8 %	150	—
Indianapolis, Ind. —Apr 22 Indianapolis Street Ry.	—	5,000,000	5,000,000	—	25	25 1/2
Lancaster, Pa. —Apr 22 Pennsylvania Traction Co. Lancaster & Col. Electric Ry. West End Street Railway.	100 — — —	10,000,000 — — —	9,900,000 — — —	— — — —	— — — —	— — — —
Louisville, Ky. —Apr 22 Louisville Ry. Louisville Ry. pfd.	100 100	4,000,000 2,500,000	8,500,000 2,500,000	1 1/2 % April. 3 1/2 % S., Oct. 1.	82 112	88 118
Minneapolis, Minn. —Apr 22 Twin City Rapid Transit. Twin City Rapid Transit. 7 % pfd.	100 —	17,000,000 8,000,000	15,010,000 1,712,200	1 1/2 % Oct.	68 1/2 186	69 1/2 187
Montreal, Canada. —Apr 22 Montreal Street Ry. Co. Toronto Street Ry. Co.	50 100	4,000,000 6,000,000	4,000,000 6,000,000	8 % S., M. & N. 1 1/2 % S., J. & J.	268 1/2 108 1/2	265 109 1/2
Memphis Tenn. —Apr 22 Memphis Street Railway Co.	100	500,000	500,000	—	21	—
New Haven, Conn. —Apr 22 Fair Haven & Westville R.R. New Haven Street Railway Co. New Haven & Centerville. Winchester Avenue R.R.	25 100 100 25	2,000,000 1,250,000 700,000 1,000,000	2,000,000 1,000,000 800,000 600,000	3 % S., Sept. 2 1/2 % A., July	39 — — —	41 — — 46
New Orleans, La. —Apr 22 Canal & Claiborne R.R. Co. New Orleans & Carrollton R.R. New Orleans Traction Co. new pfd. New Orleans Traction Co. old pfd. Crescent City R.R. guar. New Or. City & Lake R.R. guar. Orleans Railroad. St. Charles Street Railway.	40 100 100 100 100 100 50 50	240,000 1,200,000 — — 2,000,000 2,000,000 500,000 1,000,000	240,000 1,200,000 — — 2,000,000 2,000,000 185,000 1,000,000	4 % S., July. 1 1/2 % Q., Oct. — — 3 % S., Jan. 4 % S., Jan. 1 1/2 % June. 1 1/2 % Oct.	— 148 1/2 22 1/2 20 1/2 — — 56 1/2	— 158 24 26 — — 57
New York —Apr 22 Central Crosstown R.R. Christopher & 10th Sts. R.R. guar. Dry Dock, E. Bldg. & Battery R.R. Metropolitan Street Ry. Co. Bleecker St. & Fulton St. Ry. guar. Broadway & Seventh Ave. guar. Cen. Park, N. & E. Rivers R.R. guar. Eleventh Avenue R.R. 42d St. & Grand St. Ferry R.R. guar. Ninth Avenue R.R. guar. Sixth Avenue R.R. guar. Twenty-third St. R. R. Co. guar. Second Avenue R.R. Third Avenue R.R. 42d St. Manhattan & St. Nicholas Av. Union (Huckleberry) Ry.	100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100	600,000 650,000 1,200,000 45,000,000 900,000 2,100,000 1,800,000 1,000,000 750,000 800,000 2,000,000 2,000,000 600,000 2,500,000 1,862,000 10,000,000 2,500,000 2,000,000	601,000 651,000 1,203,000 45,000,000 900,000 2,100,000 1,800,000 1,000,000 748,000 800,000 2,000,000 2,000,000 600,000 1,862,000 10,000,000 2,500,000 2,000,000	2 1/2 % Q. 2 1/2 % Q., Oct. 1 1/2 % Q., Nov. 1 1/2 % Q., Feb. 1900. 3 % A., July. 2 1/2 % Q. 2 1/2 % Q. 4 % Q. 4 % Q. 4 % Q. 4 % Q. 4 % Q. 4 % Q. 2 1/2 % Jan. 1 1/2 % Q., Jan. 1 1/2 % p. sh. Feb. —	255 178 120 174 65 282 192 890 392 198 201 158 201 158 12 1/2 65 190	300 185 185 174 1/2 87 240 200 405 202 202 201 225 410 201 12 1/2 76 200
Newark N. J. —Apr 22 Consolidated Traction Co. of N. J. North Jersey Railway Co. United Elec. Co. of New Jersey.	100 100 100	15,000,000 6,000,000 504,000	15,000,000 6,000,000 504,000	— — 11 1/2 % A.	— 22 1/2 25 1/2	— 23 26
Pittsburg, Pa. —Apr 22 Allegheny Traction Co. Consolidated Traction Co. com. Consolidated Traction Co. pfd. Central Traction Co. Citizens' Traction Co. Duquesne Traction Co. Pittsburg Traction Co. Federal St. & Pleasant Valley Ry. Pgh., Allegheny & Man. Trac. Co. Pittsburg & Birmingham Trac. Ry. Pittsburg & West End Ry. United Traction Co. United Traction Co. pfd.	50 50 50 50 50 50 50 25 50 25 50 50 50 50	500,000 15,000,000 9,478,850 1,500,000 8,000,000 8,000,000 2,500,000 1,400,000 8,000,000 1,500,000 8,000,000 17,000,000 2,000,000	500,000 15,000,000 9,478,850 1,500,000 8,000,000 8,000,000 2,500,000 1,400,000 8,000,000 1,500,000 8,000,000 17,000,000 2,000,000	2 % Jan. 3 % Nov. 1 1/2 % Nov. 6 % A. 6 % A. 3 1/2 % Nov. 2 1/2 % July. 2 % Aug. 1 % Oct. 5 % A., June J. & J. T. & J.	27 214 6 1/2 78 1/2 12 1/2 — 27 — — 41 5 51 1/2	28 22 64 78 1/2 72 1/2 — 29 — — 42 1/2 15 1/2 72

*Unlisted. †Ex div.
a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.
b Leased to Boston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
e Stocks owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Rts. Co.
f Stock owned by Kings County Traction Company; road leased to Nassau Electric R.R.
g Owned by Atlantic Ave. R.R. and leased to Nassau system.
h \$30 per share on outstanding capital paid as rental by lessee—West Chicago St. R.R. Co.; \$200,000 of stock owned by North Chicago Street Railroad Company.
i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,100 of stock owned by West Chicago Street Railroad Company.
k Majority of stock owned by Chicago West Division Railway Company; 5 % on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

*Unlisted. †Full paid. ‡Outstanding. §Ex-div.
a Leased to New Orleans Traction Company at 6 % on stock.
b Leased to New Orleans Traction Company at 8 % on stock.
c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.
d Operating the former Met. Trac. system, that corporation having become extinct.
e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavyon Ferry—now Metropolitan Street Railway.
g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1895, at \$215,000 per annum.
i Leased to Metropolitan Street Railway for 18 % on stock.
j Leased to Met. St. Ry. for 99 years from April 1, 1892; 6 % first 5 years, 8 % thereafter.
k Leased to Metropolitan Street Railway for \$145,000 per annum.
l Leased to Metropolitan Street Railway for 18 % on capital stock.
m Controlled by Third Avenue Railroad by purchase.
n Dividends of 1 1/2 % yearly guaranteed by Consolidated Traction Company.
o Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.
p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
q Leased to Fort Pitt Traction Company for 6 % on \$8,000,000 capital stock.
r Leased to Consolidated Traction Company for 4 % on capital stock.
s Leased to Consolidated Traction Company for 7 % on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par.	Capital Stock.		Rate and Date of Last Div.	Rd.	Adm.	NAME.	Par.	Capital Stock.		Rate and Date of Last Div.	Rd.	Adm.
		Authoriz'd.	Issued.						Authoriz'd.	Issued.			
New Bedford Mass. —Apr 22							Boston, Mass. —Apr 22						
Railway Co.....	100	\$850,000	\$850,000	2% Feb.	160	165	American Tel. & Tel. Co.....	100	50,000,000	28,950,000	4 1/2% Q. Jan.	175	176
Northampton, Mass. —Apr 22							Erie Telegraph & Telephone Co.....						
Northampton Street Ry.....	100	830,000	225,000	4% A., June.	170	178	..	100	10,894,600	10,894,600	1 1/2% Q. Feb. 20,	60	60 1/2
Omaha, Neb. —Apr 22							New England Telephone Co.....						
Omaha Street Ry.....	100	5,000,000	5,000,000	8% A. and N.	55	65	New York. —Apr 22						
Paterson, N. J. —Apr 22							American Telegraph & Cable Co.....						
Paterson R. Co.....	100	1,250,000	1,250,000	.....	54	—	*Central & South Am. Tel. Co.....	100	6,500,000	6,500,000	1 1/2% Q.	100	108
Providence, R. I. —Apr 22							*Commercial Cable Co.....						
United Traction & Electric Co.....	100	8,000,000	8,000,000	1/2% Q. Oct.	110	111	Franklin Tel. Co..... 2 1/2% guar.	100	1,000,000	1,000,000	1 1/2% Q.	43	50
Philadelphia. —Apr 22							Erie Telegraph & Telephone Co.....						
Fairmount Park Trans. Co..... \$50 pd.	50	2,000,000	1,770,000	2% Jan.	28	24	*Gold & Stock Tel. Co. guar. 6%	100	5,000,000	4,800,000	1 1/2% Q. Feb.,	114	118
Hestonville, Man. & Fairmount.....	50	1,966,100	1,966,100	2 1/2% A., July 15,	47	48	*International Ocean Tel. Co. guar. 6%	100	2,000,000	2,000,000	1 1/2% Q.	116	118
Best'nville, Man. & Fairm't. 6% pfid.	50	588,900	588,900	2% B—July,	75	76	Mexican Telephone Co.....	100	2,000,000	2,000,000	1 1/2% Q., Jan.,	175	180
*Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	8% Feb. 1,	27 1/2	28	*New York & New Jersey Tel. Co.	100	5,000,000	5,728,000	1 1/2% Q., Jan.,	175	180
Union Traction Co..... \$12 1/2 pd.	50	80,000,000	29,980,450	.....	81 1/2	81 1/2	*Pacific & Atlantic Tel. Co. guar. 4%	25	2,000,000	2,000,000	1 1/2% Q.	70	76
Electric Traction Co.....	50	800,000	8,297,920	.....	845	845	*Postal Telegraph Cable Co.....	100	15,000,000	15,000,000	1 1/2% Q.	95	100
*Otis's Passenger Ry.....	50	1,000,000	1,192,500	\$8 share Q.	400	451	*Sout'n & Atlantic Tel. Co. guar. 5%	25	950,000	559,520	1 1/2% Q., Jan., '99.	115	118
*Frankford & Southwark Pass. R.	50	1,000,000	1,000,000	\$14 share A—Apr 99	90	90 1/2	*Commercial Union Telegraph Co.....	25	500,000	500,000	1 1/2% Q., Jan., '99.	98	133
Lombard Avenue Ry. Co.....	25	1,000,000	1,000,000	A. & O.	90	90 1/2	*Div. guar. by Postal Tel. Co.	—	—	—	—	—	—
Lombard & South Street Ry.....	25	1,000,000	1,000,000	A. & O.	90	90 1/2	Miscellaneous. —Apr 22						
*Second & Third Streets Ry.....	50	1,000,000	1,000,000	A. & O.	90	90 1/2	American Dist. Tel. (Patia.).....	25	400,000	400,000	1 1/2% Q.	26	27
*People's Traction Co.....	50	10,000,000	16,000,000	\$9 share A., Mar. '98.	90	90 1/2	Bell Tel. Co. (of Canada.).....	100	8,960,000	8,564,000	1 1/2% Q.	188	190
*Germantown Passenger Ry.....	50	1,500,000	1,500,000	8 1/2% A., April, '98.	150	151	Chesapeake & Potomac Tel. Co.....	100	1,000,000	1,000,000	1 1/2% Q.	47	70
*Green & Coates Passenger Ry.....	50	500,000	500,000	8 1/2% Jan., 1898.	151	152	Chicago Telephone Co.....	100	750,000	750,000	1 1/2% Q.	48	160
*People's Passenger Ry..... com.	25	1,500,000	1,500,000	.....	—	—	Central Dist. Ptg. & Tel. Co. (Pgh.)	100	750,000	750,000	1 1/2% Q.	75	76
*People's Passenger Ry..... pfid.	25	1,500,000	1,500,000	.....	—	—	Empire & Bay States Telegraph Co.	100	2,000,000	2,000,000	1 1/2% Q.	20	155
Philadelphia Traction Co.....	50	80,000,000	30,000,000	\$2 p. sh., Oct. '98.	97	97 1/2	Hudson River Telephone Co.....	100	2,000,000	2,000,000	1 1/2% Q.	22	128
*Catherine & Bainbridge Sts.	50	1,000,000	1,000,000	6% A—Mar., '98.	106	107	*Northwestern Telegraph Co. guar.	50	2,500,000	2,500,000	1 1/2% Q.	16	99
*Continental Pass. Ry..... guar.	50	1,000,000	1,000,000	\$6 share—July, '98.	106	107	Providence (R. I.) Tel. Co.....	50	2,500,000	2,500,000	1 1/2% Q.	16	99
*Empire Passenger Ry. Co.....	50	1,000,000	1,000,000	\$6 share—July, '98.	100	107	Southern New Eng. Tel. Co.....	100	8,000,000	8,000,000	1 1/2% Q.	16	99
*Philadelphia City Pass. Ry.....	50	1,000,000	1,000,000	\$7.50 share July '98	408	208 1/2	ELECTRIC LIGHT AND ELECTRIC MFG. COS.						
*Philadelphia & Gray's Ry. RR.	50	1,000,000	1,000,000	\$8.50 share July '98	100	809	Boston, Mass. —Apr 22						
*Midge Avenue Passenger Ry.....	50	750,000	750,000	\$12 share, July, '98.	80 1/2	809	Fort Wayne Electric trust receipts..	—	—	—	—	115	125
*Philadelphia & Darr. Ry. guar.	50	1,000,000	1,000,000	1 1/2% S., July, '98.	—	—	Port Wayne Elec. Co. T. Sec. Series A.	25	—	—	—	15	25
*17th & 19th Sts. Pass. Ry. guar.	50	1,000,000	1,000,000	1 1/2% S., July, '98.	—	—	*General Electric Co. (old) com.	100	40,000,000	30,460,000	2 1/2% Q., Aug., 1898.	221	224 1/2
*Thirtieth & 15th Sts. Pass. Ry.	50	1,000,000	1,000,000	\$11 sh. A., July, '98.	300	240	General Electric Co. (new) com.	100	18,276,000	18,276,000	1 1/2% Q., Apr., 1901	221	224 1/2
*Union Passenger Ry. Co.....	50	1,500,000	1,500,000	\$9.50 shre., July '98	240	240	T. H. Elec. Co. T. Sec. Series C.	50	—	—	—	66	66 1/2
*West Philadelphia Pass. Ry.....	50	750,000	750,000	\$10 share, July '98	262	268	Westinghouse Elec. & Mfg. Co. pfid.	50	4,000,000	3,996,063	1 1/2% Q., Jan.,	74 1/2	75
Rochester, N. Y. —Apr 22							Westinghouse El. & Mfg. Co. rights.						
Rochester Railway Co.....	100	5,000,000	5,000,000	.....	20	28	50	11,000,000	8,195,126	.....	1 1/2	124	124
Reading, Pa. —Apr 22							New York. —Apr 22						
Reading Traction Co.....	—	1,000,000	1,000,000	Semi-an., Jan. & J.	24	26	Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	1 1/2% Q., Oct., '98.	119	120
*City Passenger Ry.....	50	850,000	850,000	Jan., '98.	188	—	*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1 1/2% Q., Oct., '98.	8	13
*East Reading Electric Ry.....	50	1,080,000	1,100,000	Jan., '98.	70	—	Edison Ore Milling Co.....	100	—	—	—	—	—
St. Louis Mo. —Apr 22							Electric Vehicle Co..... com.						
Fourth Street & Arsenal Ry.....	50	800,000	150,000	.....	—	—	*General Electric Co. (old) com.	100	40,000,000	30,460,000	2 1/2% Q., Aug., 1898.	221	224 1/2
Jefferson Avenue Ry. Co.....	50	400,000	400,000	2% Dec., 1898.	—	—	General Electric Co. (new) com.	100	18,276,000	18,276,000	1 1/2% Q., Apr., 1901	221	224 1/2
Lindell Ry.....	100	2,500,000	2,400,000	1 1/2% Jan., '99.	—	—	Interior Conduit & Insulation Co.....	100	1,000,000	1,000,000	1 1/2% Q., Apr., 1901	41	—
National Railway Co.....	—	2,500,000	2,479,000	1 1/2% Jan., '99.	—	—	Kings Co. El. L. & P. Co.....	100	2,500,000	2,500,000	A. & O.	110	125
Cass Avenue & Fair Grounds.....	—	2,500,000	2,500,000	.....	—	—	Pittsburg, Pa. —Apr 22						
City of St. Louis RR.....	100	2,000,000	1,500,000	1 1/2% Oct., '98.	—	—	Allegheny County Light Co.....	100	500,000	500,000	J. & J.	168	173
St. Louis RR.....	100	2,000,000	2,000,000	1 1/2% Jan., '99.	—	—	East End Electric Light Co.....	50	800,000	800,000	Q.	—	—
Missouri RR.....	50	2,400,000	2,800,000	1 1/2% Jan., '99.	—	—	Philadelphia, Pa. —Apr 22						
People's RR. Co.....	50	1,000,000	800,000	50c., Dec., '89.	24	24 1/2	Edison Electric Light Co.....	100	2,000,000	2,000,000	1 1/2% Q., Oct.,	144	144 1/2
United Electric Ry..... com.	50	500,000	500,000	50c., Dec., '89.	79	80	*Electric Storage Battery Co. com.	100	8,500,000	8,500,000	1 1/2% Q., Oct.,	68	71
United Electric Ry..... 5% pref.	100	1,000,000	1,000,000	3% Jan., '99.	64	65	*Electric Storage Battery Co. pfid.	100	5,000,000	5,000,000	1 1/2% Q., Oct.,	67	73
*St. Louis & Suburban Ry.....	100	3,000,000	2,500,000	8% Jan., '99.	94	95	Northern Elec. Light & Power Co.	10	550,000	550,000	1 1/2% Q., Oct.,	18	18 1/2
Union Depot RR.....	100	4,000,000	4,000,000	8% A., July, '99.	—	—	Southern Elec. Light & Power Co.	10	187,500	187,500	1 1/2% Q., Oct.,	80	—
San Francisco, Cal. —Apr							Miscellaneous. —Apr 22						
California St. Cable RR.....	100	1,000,000	600,000	50c. monthly.	117	119	Bridgeport (Conn.) Elec. Lt. Co.....	25	500,000	500,000	1 1/2% Q., Oct.,	47	48
Geary Street Park & Ocean RR.....	100	1,000,000	875,000	\$2.50 share, '98.	50	—	Missouri-Edison (St. Louis)..... com.	—	—	—	—	20	21
Market Street Ry.....	100	18,750,000	18,750,000	Q., 50c. per share.	61 1/2	68 1/2	Eddy Electric Mfg. Co.....	25	—	—	—	9	14
Presidio & Ferries RR.....	100	1,000,000	550,000	Q., 50c. per share.	16	—	Hartford (Conn.) Elec. Light Co.....	100	850,000	850,000	1 1/2% Q., Oct.,	179	176
Scranton Pa. —Apr 22							Hartford (Conn.) El. & Power Co.						
Scranton Railway Co.....	50	6,000,000	2,500,000	.....	29	30	25	175,000	175,000	1 1/2% Q., Oct.,	106	107	
*Scranton & Carondale Trac. Co.	100	500,000	500,000	.....	16 1/2	—	New Haven (Conn.) El. Lt. Co.....	100	100,000	100,000	2 1/2% Q., Oct.,	103	101
*Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	.....	—	—	Narragansett (Prov., R.I.) El. Co.	50	1,200,000	1,200,000	1 1/2% Q., Oct.,	116 1/2	120 1/2
Springfield Ill. —Apr 22							Rhode Island Elec. Protec. Co.....						
Springfield Consolidated Ry.....	100	750,000	750,000	.....	—	—	100	—	—	—	—	123	123 1/2
Springfield O. —Apr 22							Royal Elec. Co. (Montreal).....						
Springfield Street Ry.....	100	1,000,000	1,000,000	.....	—	11	100	1,333,000	1,333,000	1 1/2% Q.	123	123 1/2	
Springfield, Mass. —Apr 22							Toronto (Canada) Elec. Light Co.						
Springfield Street Ry.....	100	1,200,000	1,166,700	1 1/2% A.	207	212	100	1,085,000	1,085,000	1 1/2% Q.	123	123 1/2	
Toronto Canada. —Apr 22							Thomson-Houston Welding Co						

ELECTRICITY.
BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—Apr 22, 1901

The Albany Ry. Co. Cons. mtg. 5s	\$500,000	427,500	1940	J. & J.	117½	118
The Albany Ry. Co. Gen. mtg. 5s	750,000	875,000	1947	M. & N.	116½	118
Watervliet Turnpike & RR. 1st mtg. 5s	850,000	850,000	1916	M. & N.	125	127
Watervliet Turnpike & RR. 2d mtg. 5s	150,000	150,000	1919	M. & N.	124½	127
Troy City Railway Co. 1st mtg. 5s	.....	.....	1942	.....	116½	118

Interest guar. by Albany Ry. Co.
Principal and interest guar. by Albany Ry. Co.

Baltimore Md.

Date of Quotation—Apr 22, 1901

United Electric Ry. Co. 1st mtg. g. 4s	88,000,000	18,000,000	1949	M. & S.	102	102½
..... Income 4s	14,000,000	.....	1940	J. & D.	74½	75
Baltimore City Pass. Ry. 1st mtg. g. 5s	2,000,000	2,000,000	1911	M. & N.	118½	120
Baltimore Traction Co. 1st mtg. 5s	1,300,000	1,500,000	1929	M. & N.	119	120
Baltimore Trac. Co. Exten. & Imp. g. 5s	1,250,000	1,250,000	1901	M. & S.	104½	104
Bal. Trac. Co. No. Balto. div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & J.	121	121½
Bal. Trac. Co. Coll. Trust. 1st mtg. g. 5s	750,000	.....	1900	J. & J.	101	101
Baltimore Traction Co. Convertible 5s	800,000	.....	1906	N. & M.	102½	102
Central Pass. Ry. Co. 1st mtg. 5s	96,000	117,000	1912	J. & J.	119	121
Central Pass. Ry. Co. Cons. mtg. g. 5s	604,000	580,000	1922	M. & N.	119	121
City & Suburban Ry. 1st mtg. g. 5s	8,000,000	8,000,000	1929	J. & D.	116	117
Lake Roland Elev. 1st mtg. 5s	1,000,000	1,000,000	1942	M. & S.	117	117

All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.

Boston Mass.

Date of Quotation—Apr 22, 1901

Lynn & Boston RR. 1st mtg. g. 5s	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry. Deben. g. 5s	8,000,000	3,000,000	1902	M. & N.	104½	106
West End Street Ry. Deben. g. 4½s	2,000,000	2,000,000	1914	M. & S.	112	112

† \$1,074,000 in escrow to retire outstanding bonds of absorbed companies

Charleston S. C.

Date of Quotation—Apr 22, 1901.

Enterprise Street RR. 1st mtg. 5s	500,000	47,000	1906	J. & J.	106	106
Charleston City Ry. 1st mtg. 5s	850,000	.....	.....	J. & J.	106	106

Chicago Ill.

Date of Quotation—Apr 22, 1901

Chicago City Ry. 1st mtg. 4½s	6,000,000	4,619,500	1901	J. & J.	101½	102
Chicago Passenger Ry. 1st mtg. 6s	400,000	400,000	1908	F. & A.	102	102
Chicago Passenger Ry. Cons. mtg. 6s	1,000,000	600,000	1929	J. & D.	114	114
Chicago & So. Side R. T. 1st mtg. g. 5s	7,500,000	7,500,000	1929	A. & O.	101	101
Chicago & So. Side R. T. 2d mtg. g. 5s	1,500,000	750,000	1907	J. & J.	101	101
Chicago West Div. Ry. 1st mtg. 4½s	4,040,000	4,040,000	1932	J. & J.	108½	109
Lake Street Elevated RR. 1st mtg. g. 5s	7,574,000	2,781,200	1928	F. & A.	106	106
Metrop. W. Side Elev. Ry. 1st mtg. g. 5s	15,000,000	15,000,000	1942	F. & A.	96	96½
North Chicago St. RR. 1st mtg. 5s	8,171,000	8,171,000	1906	J. & J.	106	106
North Chicago St. RR. Cert. Indeb. 6s	500,000	500,000	1911	J. & J.	106	106
North Chicago City Ry. 1st mtg. 6s	500,000	500,000	1900	J. & J.	106	106
North Chicago City Ry. consol. 4½s	2,500,000	2,500,000	1927	M. & N.	108	108
West Chicago St. RR. 1st mtg. 5s	4,100,000	8,989,000	1928	M. & N.	111	111
West Chicago St. RR. Deben. 6s	2,700,000	700,000	1911	J. & D.	101	102
West Chicago St. RR. Cons. mtg. g. 5s	12,500,000	6,000,000	1930	F. & A.	105½	107
W. Chicago St. RR. Tunnel. 1st mtg. 5s	1,500,000	1,500,000	1909	F. & A.	105	105

† Redeemable at option on 60 da. notice.
† Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.

Subject to call after Oct. 1, 1899, at \$100 and interest.

Assumed by W. Chi. RR. Co., lessee.
Int. guar. by W. Chicago St. RR. Co.

Cincinnati, O.

Date of Quotation—Apr 22, 1901

Old New & Gov. St. Ry. 1st Con. mtg. g. 5s	8,000,000	2,500,000	1922	J. & J.	114½	115
Old Adams & Eden Pk In. 1st mtg. 6s	46,000	46,000	1900	A. & O.	103½	104
Old Adams & Eden Pk In. 1st mtg. 6s	100,000	100,000	1906	A. & O.	114	114
Old Adams & Eden Pk In. Cons. mtg. 5s	581,090	581,000	1906	M. & S.	108½	108
So. Cov. & Cin. St. Ry. 1st mtg. 6s	250,000	250,000	1912	M. & S.	121½	122½
So. Cov. & Cin. St. Ry. 2d mtg. 6s	400,000	400,000	1932	J. & J.	182½	187

† Assumed by the Cin. St. Ry. Co.
† \$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—Apr 22, 1901

Brooklyn Street RR. Co. 1st mtg. 6s	600,000	600,000	1908	M. & S.	106½	107
Old New & Gov. St. Ry. Cons. mtg. 5s	8,000,000	2,500,000	1922	J. & J.	118½	119
Cleveland City Cable Ry. 1st mtg. 6s	2,000,000	2,000,000	1909	J. & J.	105½	106
Cleveland Electric Ry. Co. 1st mtg. g. 5s	8,500,000	1,249,000	1918	M. & S.	106	107
Columbus (O.) Cent. Ry. 1st mtg. g. 5s	1,500,000	1,500,000	1918	M. & N.	107	107
East Cleveland RR. 1st mtg. 5s	1,000,000	1,000,000	1910	M. & S.	107	107
W. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s	600,000	.....	1922	M. & N.	107	107
Lorain (O.) Street Ry. 1st mtg. 6s	200,000	200,000	1915	J. & J.	107	107
So. Ry. Co. Grand Rapids. 1st mtg. 5s	500,000	600,000	1912	J. & D.	107	107

† \$1,500,000 in escrow to retire bonds of absorbed companies, marked a.
Interest guar. by Cons. St. Ry. Co.

Detroit, Mich.

Date of Quotation—Apr 22, 1901

Detroit Citizens' St. Ry. 1st mtg. 5s	7,000,000	8,835,000	1902	A. & O.	102½	102½
St. Wayne & Belle Isle Ry. 1st mtg. 6s	400,000	877,000	1907	A. & O.	102	102
The Detroit Ry. 1st mtg. 5s	1,800,000	1,800,000	1926	J. & D.	105	106

† \$1,100,000 in escrow to retire bonds of Del. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—Apr 22, 1901

New Haven St. Ry. 1st mtg. g. 5s	600,000	600,000	1918	J. & D.	111	111
New Haven (Edgewood Div.) 1st mtg. 5s	250,000	250,000	1914	J. & D.	111	111
Winchester Avenue RR—1st mtg. g. 5s	100,000	500,000	1912	M. & N.	109	109
Winchester Avenue RR—Deben. g.	100,000	24,000	1915	M. & S.	109	109

*With interest. *Unlisted.

New Orleans La.

Date of Quotation—Apr 22, 1901

Canal & Claiborne RR. Cons. mtg. 6s	\$150,000	\$150,000	1912	M. & N.	105	105
Orleans City RR. 1st mtg. 6s	.....	50,000	1896	M. & N.	105	105
Orleans City RR. Cons. mtg. g. 5s	5,000,000	8,000,000	1942	J. & J.	105	105
New Orleans City RR. 1st mtg. 6s	416,500	899,000	1908	J. & D.	108	112
N. Orleans & Lake RR. 1st mtg. g. 5s	5,000,000	8,599,500	1942	J. & J.	112	118
N. Orleans & Carrollton RR. 2d mtg. g. 6s	850,000	850,000	1907	F. & A.	.....	.....
Orleans Railroad Co. Cons. mtg. 6s	800,000	800,000	1912	J. & J.	.....	.....
1st Charles St. RR. Co. 1st mtg. 6s	800,000	75,000	1907	J. & D.	.....	.....

† \$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds.

† \$90,000 outstanding.

New York.

Date of Quotation—Apr 22, 1901.

Atlantic Ave. (Brooklyn) Imp. g. 5s	1,500,000	1,500,000	1984	J. & J.	95	95
Atlantic Ave. (Brooklyn) 1st gen. mtg. 5s	759,000	759,000	1906	M. & S.	107½	110
Atlantic Ave. (Brooklyn) Cons. mtg. 5s	8,000,000	1,966,000	1981	A. & O.	115	116
Bro'dway & 7th Ave. 1st cons. mtg. g. 5s	12,500,000	7,650,000	1948	J. & D.	128	128
Bro'dway & 7th Ave. 1st mtg. 5s	1,500,000	1,500,000	1904	J. & D.	104	106½
Bro'dway & 7th Ave. 2d mtg. 5s	500,000	500,000	1914	J. & J.	108	110
Bro'dway Surface 1st mtg. 5s	1,125,000	1,125,000	1924	.....	115	117
Bro'dway Surface 2d mtg. 5s	1,000,000	1,000,000	1905	.....	105	106
Brooklyn City RR. Co. 1st cons. mtg. 5s	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown 1st mtg. 5s	2,000,000	2,000,000	1939	J. & J.	115	116
Brooklyn Bath & W. E. RR. Gen. mtg. 5s	1,000,000	448,000	1928	J. & J.	101	101
Brooklyn Heights RR. 1st mtg. 5s	250,000	250,000	1941	A. & O.	104	104
Brooklyn Q's Co. & Sub'n. 1st mtg. 5s	8,500,000	8,500,000	1941	J. & J.	112	112
Brooklyn Q's Co. & Sub'n. 1st cons. 5s	4,500,000	2,750,000	1941	M. & N.	107	107
Brooklyn Rapid Transit. gold 5s	7,000,000	5,181,000	1945	.....	106½	106½
Cent Pk. N. & E. R. RR. 1st cons. mtg. 4s	1,200,000	1,200,000	1900	J. & D.	107	109
Central Cross-town RR. 1st mtg. 6s	250,000	250,000	1922	M. & N.	125	125
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1908	J. & J.	101	108
Dry Dock, E. B'd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	980,000	1982	J. & D.	117	120
Eight Ave. RR. Co. Cert. Indeb. 6 ½	100,000	1,100,000	1914	F. & A.	102	106
12d St. Man. & St. Nich. Av. 1st mtg. 6s	1,200,000	1,200,000	1910	M. & S.	116½	117
12d St. Man. & St. N. Av. 2d mtg. inc. 6s	1,500,000	1,500,000	1915	J. & J.	89	89
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s	5,000,000	5,000,000	1938	M. & S.	124	125
Metropolitan St. Ry. Co. g. m. cl. tr. g. 5s	12,500,000	17,500,000	1997	F. & A.	120	120
Second Avenue Ry. Gen. cons. mtg. 5s	1,800,000	1,600,000	1909	M. & N.	120	121
Second Avenue Ry. Cons. mtg. 5s	800,000	800,000	1909	J. & J.	118½	109
Steinway Ry. (L. I.) 1st mtg. g. 6s	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co. 1st mtg. 5s	850,000	850,000	1919	.....	110½	112½
Third Avenue RR. 1st mtg. g. 5s	5,000,000	5,000,000	1937	J. & J.	128½	128½
Twenty-third Street Ry. 1st mtg. 6s	150,000	150,000	1909	J. & J.	106	108
Twenty-third Street Ry. Deb. 5s	2,000,000	2,000,000	1942	F. & A.	118	118
Union (Huckleberry) Ry. 1st mtg. 5s	500,000	500,000	1948	J. & J.	110	114

† \$1,055,000 in escrow to retire gen. mtg. bonds.

† \$4,850,000 in escrow to retire maturing obligations.

† \$552,000 in escrow to retire 1st and 2d mtg. bonds.

† In treasury, \$30,000.

† Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—Apr 22, 1901

Montreal St. Ry. 1st mtg. 5s	2,500,000	800,000	1908	M. & S.	.....	.....
Toronto St. Ry. 1st mtg. g. 4½s	4,550,000	2,300,000	1931	M. & S.	.....	.....

† \$85,000 per m. single track authorized.

† \$600,000 in escrow to retire 6s due in 1901.

Philadelphia.

Date of Quotation—Apr 22, 1901

Continental Pass. Ry.....	1st mtg. 6s	4,
Toronto St. Ry.....	1st mtg. 6 3/4s	4,
\$835,000 per m. single track authorized.		
\$400,000 in escrow to retire 6s due in 1901.		
Philadelphia.		
<i>Date of Quotation</i> —Apr 22, 190		
Continental Pass. Ry.....	1st. mtg. 6s	4
Empire Pass. Ry.....	1st mtg. 7s	6
Greene & Coates St. Ry.....	1st mtg. 6s	1
Lombard & So. St. Pass. Ry.....	1st mtg. 6s	1
People's Pass. Ry.....	1st mtg. 7s	2
People's Pass. Ry.....	2d mtg. 5s	5
People's Pass. Ry.....	Cons. mtg. 5s	5
People's Pass. Ry.....	8 1/2s. cert. g. 4s	1,6
Phila. City Passenger Ry.....	1st mtg. 5s	1,6
Philadelphia Trac. Co.....	Coll. tr. g. 4s	1,8
Thirteenth & 15th St. Ry.....	1st mtg. 7s	10
Union Passenger Ry.....	1st mtg. 5s	50
Union Traction Co.....	Coll. tr. 4s	29,7
West End Passenger Ry.....	1st mtg. 5s	25
West Phila. Pass. Ry.....	1st mtg. 6s	25
West Phila. Pass. Ry.....	2d mtg. 5s	25

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bid.	Asked.
	Authorized.	Issued.				
ST. LOUIS.						
Date of Quotation—Apr 22 1901.						
Jefferson Avenue Ry.....1st mtg. 6a.	270,000	270,000	1908	M. & N.	112	113
Lindell Ry. Co.....1st mtg. 6a.	1,000,000	1,000,000	1911	F. & A.	117	118
Missouri RR. Co.....1st mtg. 6a.	1,000,000	700,000	1916	M. & S.	108	109
Mount City RR. Co.....1st mtg. 6a.	400,000	800,000	1910	A. & O.	104½	105½
People's RR. Co.....1st mtg. 6a.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 6a.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....3d mtg. 6a.	1,000,000	800,000	1904	J. & J.	100	101
People's RR. Co.....Cons. mtg. 6a.	75,000	75,000	1905	J. & J.	100	101
St. Louis & E. St. L. Electric 1st mtg. 6a.	2,000,000	2,000,000	1900	M. & N.	99½	100½
St. Louis & E. St. L. Electric 2d mtg. 6a.	2,000,000	1,400,000	1921	F. & A.	108	109
St. Louis & Sub. Ry.....1st mtg. 6a.	800,000	800,000	.....	.....	80	84
St. Louis & Sub. Ry.....Income 6a.	800,000	500,000	1909	M. & N.	108	109
Southern Electric Ry.....Cons. mtg. 6a.	500,000	500,000	1918	J. & J.	116½	117½
Taylor Avenue St. Ry.....1st mtg. 6a.	500,000	500,000	1900	A. & O.	100	100½
Union Depot RR. Co.....1st cons. mtg. 6a.	1,091,000	1,091,000	1900	A. & J.	121	122
Union Depot RR. Co.....Cons. mtg. 6a.	8,500,000	1,787,000	1918	J. & J.	.....	.....
†Controlled by St. Louis RR. Co.						
†Controlled by Union Depot RR. Co.						
†Controlled by Lindell RR. Co.						
†\$200,000 in escrow to retire 1st & 2d mtg.						
†\$200,000 in escrow.						
†\$200,000 in escrow to retire 1st mtg. 6a.						
San Francisco Cal.						
Date of Quotation—Apr 22 1901.						
California St. Cable RR.....1st mtg. 6a.	1,000,000	900,000	1915	J. & J.	114	117
Ferris & Cliff House Ry.....1st mtg. 6a.	650,000	650,000	1914	M. & S.	.....	96
Geary St. Park & Ocean RR.....1st mtg. 6a.	1,000,000	671,000	1921	A. & O.	126½	.....
Market St. Cable Ry. Co.....1st mtg. 6a.	8,000,000	8,000,000	1918	J. & J.	126½	.....
Metropolitan Ry. Co.....1st mtg. 6a.	300,000	2,000,000	1918	A. & O.	126½	.....
Omnibus Cable Co.....1st mtg. 6a.	2,000,000	850,000	1912	J. & J.	106½	107
Park & Cliff House RR.....1st mtg. 6a.	850,000	250,000	1914	J. & J.	115	.....
Park & Ocean RR.....1st mtg. 6a.	250,000	700,000	1912	M. & S.	.....	125
Powell St. Ry.....1st mtg. 6a.	700,000	900,000	1918	M. & N.	.....	.....
Sutter St. Ry. Co.....1st mtg. 6a.	1,000,000	.....	.....	.....	.....	.....
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Apr 22 1901.						
Belt Ry. Co.....Cons. mtg. 6a.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 6a.	500,000	500,000	1914	A. & O.	122	.....
Rockington & Soldiers' Home.....1st mtg. 6a.	300,000	300,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 6a.	500,000	500,000	1901	J. & J.	.....	.....
†\$50,000 in escrow to retire 1st mtg. 6a.						
Miscellaneous.						
Date of Quotation—Apr 22 1901.						
Bridgeport Traction Co.....1st mtg. 6a.	2,000,000	1,988,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 6a.	5,000,000	3,548,000	1981	F. & A.	118	.....
C'vicens St. Ry. (Ind'polis) 1st cons. m. 6a.	4,000,000	3,000,000	1988	M. & N.	104	109
Croftown St. Ry. (Buffalo) 1st mtg. 6a.	8,000,000	3,866,000	1982	M. & N.	112	118
Columbus (O.) St. Ry.....1st cons. g. 6a.	8,000,000	3,261,000	1982	J. & J.	118	.....
Consolidated Traction (N. J.) 1st mtg. 6a.	15,000,000	12,968,000	1988	J. & D.	111½	113½
Croftown St. Ry. (Colu's O.) 1st mtg. g. 6a.	2,000,000	672,000	1988	J. & D.	116	118½
Croftown St. Ry. (Colu's O.) 2d mtg. g. 6a.	4,000,000	8,800,000	1920	J. & J.	20	85
Denver City Cable Ry.....Cons. m. g. 6a.	4,000,000	922,000	1988	A. & O.	80	119½
Denver City Cable Ry.....1st cons. mtg. g. 6a.	6,000,000	4,981,000	1980	J. & J.	119	119½
Louisville (Ky.) St. Ry.....1st cons. mtg. g. 6a.	5,000,000	4,060,000	1919	J. & J.	110½	110½
Minneapolis St. Ry. (N. J.) Cons. mtg. 6a.	8,000,000	2,878,000	1928	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.) 3d mtg. 6a.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.) Deb. 6a.	500,000	489,000	1902	F. & A.	.....	.....
No. Hudson Co. Ry. (N. J.) Cons. mtg. 6a.	1,250,000	1,000,000	1981	J. & D.	.....	.....
Paterson (N. J.) Ry.....Cons. mtg. 6a.	3,000,000	2,000,000	1980	A. & O.	.....	.....
Worcester (N. Y.) Ry.....1st mtg. 6a.	5,000,000	4,298,000	1987	.....	106½	108
St. Paul City Ry.....Cons. g. 6a.	8,000,000	1,000,000	1900	.....	108	.....
St. Paul City Ry.....Deb. g. 6a.	1,000,000	.....	.....	.....	.....	.....
†\$100,000 in escrow to retire 1st and 2d mtg. 6a.						
†\$200,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
†\$750,000 in escrow to retire bonds of C. St. Ry. Co.						
†\$197,000 in treasury.						
†\$200,000 reserved to redeem prior flow						
†\$200,000 in escrow.						
*With int' res.						

ELECTRIC LIGHT AND ELECTRICAL MFG. CO'S

Boston, Mass.						
Date of Quotation—Apr 22, 1901.						
Delaware Gas Lt. Co.....1st m. 6a. g.	800,000	800,000	.....	J. & J.	108	109
Edison Elec. Illuminating Co., Boston...	2,026,000	8,750,000	1922	Quar.	116	.....
General Electric Co. gold coup. deb. 6a...	10,000,000	.....	.....	.....	.....	.....
Pittsburg Pa.						
Date of Quotation—Apr 22, 1901.						
Allegheny County Light Co.....6a.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Scrip 6a.	196,870	.....	.....	M. & S.	.....	.....
Miscellaneous. —(Apr 22, 1901.)						
Edison El. Illg. Co. (N. York) 1st m. 6a...	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Illg. Co. (N. York) con. m. g. 6a.	15,000,000	3,188,000	1998	.....	124	.....
Edison Elec. Illg. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122½	124
Edison Electric Light (Philadelphia)...	2,000,000	.....	.....	.....	.....	.....
Edison Co. El. Lt. & Pow. Co. 1st mtg. 6a.	2,500,000	.....	1987	A. & O.	100	101
Kings Co. El. Lt. & Pow. Co. pur. money 6a.	5,176,000	.....	1997	A. & O.	120	122
Milwaukee El. Ry. & Lt. Co. 1st con. g. 6a.	8,000,000	.....	.....	F. & A.	102½	.....
United Elec. Light & Power Co. (N. Y.)...	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous						
Date of Quotation—Apr 22, 1901.						
American Bell Telephone.....6a.	.....	.....	1908	F. & A.	100%	101
Northwestern Telegraph Co.....7a.	.....	.....	.....	.....	114	115
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 6a.	.....	.....	1911	J. & D.	108	116
Chesapeake & Potomac Teleph. Co.....6a.	.....	.....	.....	.....	.....	.....

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—Apr 22, 1901.						
American Electric Heating.....7a.	500,000	500,000	.....	.....	.....	25
Armington & Sims Engine Co.....6a.	.....	.....	.....	.....	106	107
Barnes & Smith Car Co.....6a.	.....	.....	1902	J. & J.	.....	.....
Carborundum Mfg. Co.....6a.	.....	.....	.....	J. & D.	.....	.....
Worthington Pump Co.....6a.	75,000	.....	.....	.....	115	127
Galifed	.....	.....	.....	.....	.....	.....

ONTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16¾c.; Lake, 17@17½c.; casting, 16½@16¾c.

Directors of the Bell Telephone Company have declared the regular quarterly dividend of 2 per cent.

The Chicago Edison Company has declared the regular quarterly dividend of 2 per cent., payable May 1. Books closed April 23.

The Union Elektricitäts-Gesellschaft of Berlin, owner of the Thomson-Houston patents for Germany, has declared a dividend of 10 per cent.

The Hudson River Telephone Company has declared a quarterly dividend of 1½ per cent., payable May 1. Books closed April 20 and reopen May 2.

A United Power and Transportation director says that any idea that the company will call the \$5 balance on the stock in the near future is incorrect.

The National Carbon Company has declared the regular quarterly dividend of 1½ per cent on its preferred stock, payable May 15. Books close May 4 and reopen May 16.

The Union Traction Company of Philadelphia has taken over the Frankford and Fairmount Park line, originally incorporated by William Wharton, and already partly constructed by the Union Traction Company.

The Copper Cobre Company was incorporated in New Jersey on Monday with a capital of \$1,000,000. The incorporators were John L. Elliot, Oscar Bergstrom, and Benjamin Prince.

Advices from Boston state that the United Electric Securities Company has declared the regular semi-annual dividend of \$3.50 on the preferred stock, payable May 1 to stock of record April 22.

W. J. Latta has resigned from the board of the Electric Company of America. Clement A. Griscom, president of the International Navigation Company, has been chosen to fill the vacancy.

The election of John I. Sabin, of San Francisco, president of the Central Union and Chicago Telephone Companies, places under his control the states of Iowa, Illinois, Indiana and Ohio, excepting Cleveland and Cincinnati.

It seems to be believed, says the Philadelphia "Stockholder," that the General Electric melon will not be cut for some time. One of the explanations offered is that the management does not wish to invite foreign competition.

The Staten Island Electric Railroad Company reports for the quarter ended March 31: Gross earnings, \$36,535; operating expenses, \$35,761; net earnings, \$834; other income, \$254; total income, \$1,088; fixed charges, \$25,000; deficit, \$25,912.

Plans are nearing completion for the Susquehanna River Electric Light & Power Company, which will furnish power from the river at Conowingo, Md., to Baltimore, Philadelphia and Wilmington. The company is expected to issue \$12,000,000 bonds.

Stockholders of the General Electric Company are in receipt of a circular, signed by M. F. Westover, secretary, relative to the exchange of General Electric preferred stock share for share for common stock. Such exchanges can be made between May 15 and August 1.

A party of English capitalists made a tour of inspection over the Brooklyn Rapid Transit system recently, accompanied by some of the directors of that company. They not only inspected the road itself, but the power houses and shops. It is understood that their purpose in making this examination was to satisfy themselves of the desirability of the property for investment purposes.

The following are quotations for some of the industrial stocks not quoted elsewhere: Electrical Load Reduction, 4½@4¾; Electric Boat, 18@20; Electric Vehicle, 12@14; Tel. & Tel. Company of America (full paid) 6@7; Electric Company of America, 9½@9¾; National Carbon, 16@16¾.

The movement of Amalgamated Copper on the Stock Exchange Monday was very erratic. Closing on Saturday at 126 the stock opened down over 4 points, then went up 3½, then went down 6 points, only later again to go up nearly 4 points, closing with a net loss of 3¼ points on dealings in 88,000 shares.

It is rumored that the Brooklyn Rapid Transit now has in its treasury about \$5,000,000 cash, the result of sales of treasury securities. The company's treasury is now abnormally supplied with money for all needs, and some think this may influence the payment of a small dividend this summer. This, however, is not the general view of inside interests.

There is surprise in Wall Street over the movement in the tractions, particularly in Brooklyn Rapid Transit, which is said to be due "to important developments" in the various properties. Some announcement of the kind, whether true or false, is certainly due, and one street theory now takes the form that Metropolitan has been held in repression throughout the general upward movement for a purpose known only to insiders.

Thompson, Tenney & Crawford, bankers, own and offer for sale, recommending the bonds as a choice investment security, \$750,000 first refunding mortgage 5 per cent. sinking fund gold bonds issued by the Erie Electric Motor Company, owning and operating all of the street railway companies in the city of Erie, Pa. The announcement includes the statement of the gross earnings of the railroad, showing for the year 1900 over \$180,307, while those for 1901 are estimated to be \$200,000. The net income for the same period was for 1900 \$72,660, and is estimated for the present year at \$85,000. A sinking fund provides for the redemption of these bonds by an annual payment of 1 per cent. from April 1, 1906, to 1915, inclusive, and 1½ per cent. from April 1, 1916 to 1941.

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EDITORIAL NOTES.

The Ninth Annual Report of the General Electric Company.

As has always been our custom we publish in full elsewhere in this issue the Ninth Annual Report of the General Electric Company. The report shows gross receipts for the year ended January 31, 1901, of \$29,829,652.23, as compared with \$23,248,170.45 for the year ended January 31, 1900. The undivided earnings during the year amounted to \$4,276,150.12, which added to the surplus at the commencement of the year give \$6,629,180.64, as the total surplus on January 31, 1901. The sum of \$1,728,249 was paid in dividends on the preferred and common stock, while \$240,040.33 is given as the interest on debentures.

The patent account is carried at \$2,000,000, the same as in the previous report, in spite of the fact that there was expended during the past fiscal year \$360,258.99 in patents and patent litigation, and \$604,672.27 in obtaining the patents and good will of the Siemens & Halske Electric Company of America and the Marks Enclosed Arc Lamp Company.

The report shows the capital liabilities of the General Electric Company to be—common stock, \$21,400,300; preferred stock, \$2,551,200, and debentures \$1,534,000. There is a movement on foot to retire the preferred stock, and it is reported that this retirement is preliminary to an increase in the common stock to about \$35,000,000.

An English Engineer's Objections to Subways for Electric Wires.

In a number of English cities suggestions have recently been made for the construction of underground subways to carry electric, telephone and telegraph wires, gas, water and other pipes, etc., so as to avoid the continual opening up of public roads, which has lately given rise to such great inconvenience not only in London but in most of the large cities of this country as well. In the course of a discussion at the Glasgow, Scotland, section of the Institution of Electrical Engineers, Mr. Chamen mentioned a few objections to the idea, which to his mind stamp it as impracticable from an engineering point of view. Mr. Chamen is the city electrical engineer of Glasgow, and he says that the engineers of gas

and water departments are not at all enthusiastic about such proposals. The gas engineer objects that the tunnel or subway might become accidentally filled with a highly dangerous explosive mixture of gas and air; the water engineer points out that in the case of a large water main bursting—an accident which will happen occasionally in spite of all precautions—matters would be in a serious state inside the tunnel. Mr. Chamen also asked how access was to be provided for such cumbersome articles as 9 ft. or 12 ft. lengths of cast-iron pipes 4 feet in diameter, and whether the tunnel was to be sufficiently large to accommodate a railway for the purpose of conveying through it such goods as would be needed for repairs.

* * *

Electricity as a Motive Power on Trunk Line Railroads.

In our last issue we commented on an article from the pen of Mr. Albert L. Johnson, which has brought forth an interesting communication from Mr. Charles J. Kintner, the well-known patent expert of this city, which we deem sufficiently important to give in these columns. Mr. Kintner writes as follows:
Editor *ELECTRICITY*.

SIR: Referring to your editorial, on page 246 of the issue of April 24th, entitled "Electricity and Railroads," I beg to differ with you as to the future use of electricity in connection with through or trunk lines between cities. I think Mr. Albert L. Johnson is correct in his view of the fact that the scheme which he proposes will so vastly increase the traffic as to guarantee a fair interest upon the investment, based upon the present conditions of imperfect service. In fact, I am confident that this is true in the knowledge of what has been done on parallel lines, steam and electric, in Michigan, between the cities of Detroit and Ann Arbor, where the through fare on the steam road, namely, the Michigan Central, is \$1.10 and on the electric road 50 cent-fares to intermediate places being correspondingly proportioned. Electric trolley cars have been running between these two cities for a number of years and have paid, I am advised, good dividends upon the investment. In fact the success of this road has been such that a second electric line has been chartered between the cities of Jackson and Detroit, running through Ann Arbor, parallel

with both of the before-mentioned lines, and is now being built.

A strange feature of the conditions may be noted also, in that through traffic between Detroit and Ann Arbor, on the Michigan Central road has not been materially diminished. This can all be accounted for probably upon the theory that the railway trains only stop at stations about 10 miles apart and run with less regularity, while the trolley cars take and drop passengers at all points and run half hourly all day long, thus verifying Mr. Johnson's views.

There are other matters to be considered also, which I think it is entirely probable you have not thought of; to wit, the fact that it is possible to increase the speed to such an extent as to make it desirable for passengers to travel by such means, even should it be found necessary to increase the fare. It is also possible and entirely practicable to construct a trunk or through electric road which is absolutely safe from front and rear end collisions and at crossings and sidings, and without the intervention of human controlled block systems such as are now deemed the best methods of protecting high speed steam trains from collisions. This, you will readily understand, because it is possible to so control the application of electrical energy to the cars as to prevent any car from colliding with another, either in the front or rear, and also to prevent accidents at draw-bridges, a condition of affairs not possible with existing steam lines, for the reason that the power with steam lines is always under the control of the engineer only of each train; whereas, the power with electric lines may be absolutely cut off when a car approaches too closely to another car preceding it on a sectional third rail in advance.

The N. Y., N. H. & H. Railroad, is working successfully, on a number of its branches, electric third rail traction systems, and contemplates, I am advised, in the not distant future, the manipulation of its entire road by electricity.

The problem, it seems to me, is very closely kindred to that which presented itself when the elevated roads were first introduced in New York City. At that time it was said that the elevated roads would undoubtedly "kill" the surface roads, whereas, as a matter of fact, it was found that the elevated roads not only accumulated sufficient business to pay dividends, but also, strangely, the parallel surface roads were found to be doing an increased business, this being due to the fact that while the elevated roads carried passengers through to the upper parts of the city, the surface roads were doing an increased business on what may be termed a "short haul" or local passenger traffic.

This condition is the same found on the Michigan roads above referred to. I am of the opinion that Mr. Johnson has not misstated the case of the future of electrical railways, and while they may not "doom" the steam systems, they will certainly be as prosperous and as useful as he predicts.

Yours truly,

CHARLES J. KINTNER.

45 Broadway, New York, April 24, 1901.

Mr. Kintner's comments are to the point, but if we mistake not, we are looking at the subject from two different standpoints. We had no intention of asserting that an electric road paralleling a steam road would not pay, but what we do claim is that the time is not

yet ripe, and will not be for many years to come, for the substitution of electricity for steam on trunk line railroads. As an example, it can be shown in figures that the Pennsylvania Railroad would gain nothing and would simply be expending immense sums of money uselessly were it to undertake to convert its lines from New York to Chicago and still further West into electrically-operated lines. We presume that Mr. Johnson refers to such a radical change when he states that "we must start afresh from the ground up, discarding the cumbersome and expensive mode of operation now in use on the steam railroads."

Both the electric third-rail system and the electric locomotive undoubtedly have their usefulness, but as Mr. Yerkes said, when referring to this subject some time ago, "for long-distance strides over continents, the electric locomotive is as yet only a dream."

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

MR. J. A. LEONARD, of Mechanicsville, N. Y., who was formerly the engineer in charge of the construction of the Hudson River Power Transmission Company's dam, has sailed for Porto Rico where he will be engaged in building a railroad and power plant.

PROF. GUGLIELMO MARCONI, inventor of wireless telegraphy, is engaged to be married to an American girl. His fiancée is Miss Josephine B. Holman. Her father was the late Justice J. Holman of the Supreme Court of Indiana. Prof. Marconi met his intended wife on board ship in his recent trip to this country. He sailed for Europe last week, but it is said that the ceremony will be performed in this city in the fall.

The Glasgow International Exhibition will open on May 2. A dispatch states that the preparations are so far complete that the management last week invited a large party of home and foreign newspaper men to inspect the show, which is certainly the best of the secondary exhibitions that have been given in Europe in the past half century. The American exhibits are very creditable, but are limited and practically confined to machinery and tools.

A PARTY of Philadelphia capitalists will start a system in Mexico for the employment of peat in the generation of heat and power. William A. Stern of Philadelphia, who has been conducting for a year or more experiments looking to the utilization of this product, has demonstrated that peat is adaptable for the generation of power with a commercial efficiency of over 60 per cent., of that of the best bituminous coal. This means much to industrial enterprises, as in the City of Mexico coal costs an average price of \$20 per ton, while the quantity of peat declared to be equivalent in heating value to a ton of coal can be delivered for \$2.

FROM RETURNS received from the thirty-five electric railways of Canada, the Dominion statistician makes up the following statement: At the end of December, 1900, the number of miles of electric railway, in Canada, increased to 681 miles, or 49 miles over the number in the year previous. These railways carried 118,-

129,862 passengers in 1900, an increase of 14,097,203. This is equal to carrying the total population of the country 21 times. The car mileage run was 30,924,355 miles, an increase of 1,277,508 miles over last year. The mileage run and the passengers carried show that for each mile run the electric carried 2.8 passengers against 3.5 in 1899. The amount of paid-up capital invested in electric on the 31st of December, 1900, was \$20,633,000, and the bonded debt was \$12,619,422. The number of cars in active service in 1900 was 1,642, an increase of 98 over the previous year. The employees numbered 4,493, showing an increase of 164 over 1899. The total receipts for the year were \$5,422,540, and the expenses were \$3,268,001. Since 1897, the number of passengers carried by the electric railways increased from 83,811,000 to 118,130,000, an increase of about 41 per cent.

THE American Mathematical and American Physical Societies opened their spring meeting at Columbia University Saturday. Scientists from various universities and cities attended. Among the papers read were "The Efficiency of the Acetylene Flame," by E. L. Nichols, and "The Specific Heat of Electrolytes in Solution," by William F. Magie, of Columbia University.

LONDON'S automobile show opens May 4.

A REPORT from Aspen, Col., states that in the Della S. mine has been made a great discovery in a new mineral. When this ore was first struck it was not considered of any value, but the continuance of the ore body excited some curiosity to know just what it was, and Manager Anderson had a test made with the result that it surprised him. It proved to be cadmium, a rare mineral used by Edison in his recently discovered storage batteries. With the discovery of cadmium, Edison declared electricity would become cheaper than water.

A DISPATCH from London says in consequence of the complaints of the transatlantic steamship companies the Board of Trade has ordered a wireless signaling station to be erected at Fastnet Rock. Vessels fitted with the necessary apparatus will thus be enabled to save the time now consumed in communicating with the station on the mainland.

AT Albany, April 25, the Governor signed the bill of Mr. Doughty, providing for registration of automobiles with the Secretary of State and allowing them to run on any highway in the State at a speed not to exceed fifteen miles an hour, outside of incorporated cities and villages.

ONE of the difficulties, in connection with the street car service in Havana, Cuba, says Mr. Wm. M. Doull, the secretary-treasurer of the Cuban Electric Railway, of which Mr. A. F. Gault, of Montreal, is president, is the fact that they have no five cent pieces to use. This has been overcome, but not satisfactorily. They have the paseta, which is equal to fifteen cents, and for this piece of money three tickets are secured. Mr. Doull was in Havana when the first section of the street railway was opened for traffic, and he states that the success, in the way of traffic, was even better than was ever anticipated. The first start made was on ten miles, and the company had not sufficient cars to accommodate the crowds

that wanted to avail themselves of the new system of travel through Havana's streets.

WHAT is believed to be the largest electrically operated drawbridge in the world is the new one over the Connecticut River at Middletown. It consists of two fixed spans, 200 feet from center to center; two fixed spans, 225 feet from center to center, and one draw span 450 feet from center to center of piers. Although the bridge is 30 miles from the sea there is a tide of two and a half feet, and the highest known water-mark is twenty-five feet above low water. The floor of the bridge is six feet above the last elevation, making the distance from the floor to low water thirty-one feet. As the bridge was designed to have one trolley-car track, and two lines for carriage travel, it was made 26 feet wide from center to center of the trusses, while provision was also made for connecting sidewalk brackets to the floor beams when they should be needed.

It is stated that Atlantic City, N. J., is experimenting with a motor power garbage cart.

FRENCH BISKRA, on the edge of the Sahara Desert, is lighted by electricity.

THE question whether there will be one or several power houses for the Rapid Transit subway, being built in this city, has been practically decided by the engineers of the construction company. There will be one main power house, larger than either the Manhattan or Metropolitan plants, with several sub-stations for the distribution of the electrical energy. Another department of the Rapid Transit Subway Construction Company has been established by the appointment of J. Van Vleck as mechanical engineer with authority to organize a force and coöperate with the electrical engineer, L. B. Stillwell, in the construction of the power plant. The site of the power house has not yet been determined. It is a question of real estate values principally.

A COMBINED motor-driven lawn mower and roller has been invented by an Overbrook, Pa., genius.

OWING to the recent storms, which have necessarily retarded work on the buildings of the Pan-American Exposition at Buffalo, it has been decided not to formally open the Exposition before May 20.

JAMES DOUGLASS REID known throughout the country as "the father of the telegraph," died Sunday at his home, 244 West Ninety-ninth street, this city. Mr. Reid was a pioneer in the use of the telegraph and a confidant of S. F. B. Morse. In 1845 Mr. Reid built the first telegraph line from Lancaster to Harrisburg. He was afterward superintendent of the Magnetic Telegraph Company's line from New York to Washington, of the Atlantic and Ohio line to Pittsburgh from Philadelphia, and of the New York, Albany and Buffalo lines. He founded the "National Telegraph Review" in the early fifties.

A LONG-DISTANCE run with a light electric motor car was carried out recently in France by M. Garcin between Paris and Mantes and back, when a distance of 85 miles on one charge of the battery was covered in 6 hours 32 min. 55 sec. The vehicle weighed complete 14 cwt. 3

lbs., and was fitted with a battery of accumulators of the Buquet-Garcin-Schiore type of 120 ampere hours' capacity and weighing only 64 cwt. The run, according to the London "Electrician," is claimed to be a record for a car of such light weight.

WITH a reorganized company, new engineers and new capital, the old Hudson River tunnel project has been revived, and there is a prospect of an early resumption of work after nine years of idleness. Changed conditions in the money market and the boom in bridges and tunnels at present existing have led the owners of the property to take steps for the completion of the tunnel, which now extends two-thirds of the distance from Jersey City to the foot of Morton street, in this city. The old tunnel has been pumped out and is said to be in as good condition as when work was stopped in April, 1892. Bids have been invited from contractors who have had experience in tunnel building, and it is asserted that the tunnel can be completed from shore to shore in one year's time. Those who are in a position to know the plans of the company deny that the tunnel has been obtained by A. L. Johnson to give his trolley line an entrance into New York, or that the Pennsylvania Railroad Company has an option on the passageway, as has been rumored.

A DISPATCH from San Francisco states that electric power generated on the Yuba River, 140 miles away, was used in the operation of street cars in Oakland on April 28. This is said to be the longest transmission of electric power in the world. The power is generated by turbine wheels. The cable, 140 miles in length, is six-tenths of an inch in diameter and is of copper, with aluminum alloy, which will prevent oxidization. It is this cable that is suspended across Carquinez Straits by a span of 4,400 feet and 300 feet in air. The test is considered one of the most successful in the history of electricity, a current of 40,000 volts having been transmitted the entire distance with a loss not exceeding 5 per cent.

A PRESS report states that Senator Clark of Montana, who is now in Europe, has obtained control of an electrolytic process for manufacturing copper sheets and tubes from the crude copper at a great saving in cost. The latter, it is claimed, will amount to as much as \$100 a ton on the finished material.

THE Rapid Transit subway of this city is one-tenth completed, and from now on work will be done at the rate of \$1,000,000 a month.

ACCORDING to "Lightning," London, Kugel of Berlin, Germany, has been granted a patent on a method of depositing nickel electrolytically in layers of any desired thickness. The product is said to be equivalent to rolled nickel as regards its mechanical properties, toughness, durability and capability of extension. The nickel solution is acidified by a mineral acid which is unalterable by the electric current. While such an addition usually spoils the nickel bath through causing the deposit to flake off, this is obviated by keeping the electrolyte at a temperature over 30° C., when a homogeneous non-crystalline metal is deposited of the above characters and of any required thickness.

General Electric's Ninth Annual Report.

RESULTS OF THE PAST YEAR'S BUSINESS.

Statements of the President, First, Second and Third Vice-Presidents.

The following is the full text of the General Electric Company's Ninth Annual Report—for the year ending January 31, 1901:

PRESIDENT'S REPORT.

SCHENECTADY, N. Y., April 20, 1901.

To the stockholders of the General Electric Company:

The profits of your company for the past year (including a profit of \$419,066.80, derived from the sale of securities), after deducting all general, patent and miscellaneous expenses, expenditures on factory plants and machinery and allowances for depreciation and losses were.....\$6,244,439.45
Dividends on preferred and common stock and interest on debentures.....1,968,289.33

Balance added to surplus account \$4,276,150.12

For details of the business in the departments of the First, Second and Third Vice-Presidents, attention is especially called to the subjoined reports of those officers.

Your attention is called to the certificate of public accountants hereto attached.

I regret to announce that Mr. J. P. Ord, who has for many years rendered services of the highest value to the company as its Second Vice-President, has tendered his resignation of the office to take effect upon the date of the next annual meeting.

Fortunately for your interests the company will still have the aid and counsel of Mr. Ord as a member of its Board of Directors.

Mr. Hinsdill Parsons, the able head of the law department at Schenectady, has recently been elected Fourth Vice-President of the company.

The admirable and effective work done in each of the various departments of the company is deserving of the highest commendation.

By order of the Board,

C. A. COFFIN, President.

FIRST VICE-PRESIDENT'S REPORT.

SCHENECTADY, N. Y., April 20, 1901.

C. A. Coffin, Esq., President General Electric Company.

SIR: I submit herewith a brief report of the sales department for the fiscal year ending January 31, 1901:

Total orders received.....\$27,969,541
For the four previous years the orders have been as follows:

Fiscal year ending	Orders received.
January 31, 1897.....	\$11,170,319
" " 1898.....	14,382,342
" " 1899.....	17,431,327
" " 1900.....	26,323,626

In reports of orders received, we exclude services of experts, freight and transportation charges, bare copper wire and engines and boilers and other apparatus and supplies not manufactured by the General Electric Company.

During the year over 150,000 separate supply

orders were received, averaging over \$60 each, and over 12,000,000 incandescent lamps were ordered.

Over 87 per cent. of the year's orders were on our standard terms, i.e. cash within sixty days.

We received orders for over 350,000 horse-power of alternating and direct current generators, and more than 600,000 horse-power of electric motors and transformers for various uses.

LOCAL OFFICE STOCKS.

Our local office inventories and their classification for the past five years are as follows:

Fiscal year ending.	Book value.	Classification.		
		Active.	Inactive.	Obsolete.
		Per cent.	Per cent.	Per cent.
Jan. 31, 1897.....	\$511,919	86.	12.	2.
" " 1898.....	437,400	90.	8.	2.
" " 1899.....	478,023	92.5	6.5	1.
" " 1900.....	658,064	96.6	2.8	0.6
" " 1901.....	702,044	98.	1.6	0.4

GENERAL REMARKS.

Long distance transmission plants have continued to increase in number and importance. One of the most interesting contracts of this character is one closed this year for the electrical equipment of a power station, the construction of a pole line nearly 100 miles long, and for supplying 4,000 hp. of our motors, to operate mining machinery at the Kolar Gold Fields in the State of Mysore, India. This contract was awarded to us after an exhaustive investigation, and a careful study on the part of the engineers of the Mysore Government, of the competitive tenders of the principal electrical firms of the world.

The consolidation of various small railway and lighting systems under one management has resulted in the concentration of electrical apparatus in large stations equipped with alternating apparatus and supplying energy over a considerable area; the system employed being that of the revolving field generator and rotary converter, mentioned in previous reports. The demonstrated economies of our early installations of this character have led to a great extension of this kind of business. Among the important contracts is one for 30,000 hp., in large generators for the initial equipment of the new power house of the Niagara Falls Power Company at Niagara Falls.

During the past year we have established an office in London for the better conduct of our European business, and such business from the British Colonies and other parts of the world as naturally focuses in London.

The selling organization has responded cheerfully to the extra demands upon it due to the growth of our business during the past two years, and I desire to express my appreciation of the faithful and efficient work of the individuals comprising this organization.

Respectfully submitted,

EUGENE GRIFFIN,
First Vice-President.

THIRD VICE-PRESIDENT'S REPORT.

SCHENECTADY, N. Y., April 20, 1901.

C. A. Coffin, Esq., President General Electric Company.

SIR: I submit herewith report on manufacturing and engineering for the fiscal year ending January 31, 1901:

MANUFACTURING.

Our large and increasing business has required the expenditure, for extensions to existing buildings and the erection of new ones,

and for additional machinery, of approximately \$1,200,000, exclusive of the cost of patterns, special tools, furniture, etc.

At the Schenectady Works, the extensions to Building 23 of about 40,000 sq. ft., to provide for the increased demand for switchboards, controllers and similar apparatus, and to the iron foundry, of about 40,000 sq. ft., both mentioned in my last report, were completed during the year.

A new porcelain shop of 46,000 sq. ft., and buildings for the manufacture of special insulating materials, aggregating 30,000 sq. ft., have also been completed.

To provide adequately for the increased power required for testing and manufacturing purposes, and for the necessary heating of the extensions to plant, our power house has been extended and additional boilers and engines aggregating 6,000 horse-power have been installed.

We are now erecting a pattern shop of 52,000 sq. ft., and adding about 70,000 sq. ft. to our machine shop facilities.

At the Lynn Works, extensions amounting to 70,000 sq. ft. have been made to various departments.

At the Harrison Works, a fireproof storage building of 68,000 sq. ft., is nearly completed.

The present floor area of all our factory buildings is approximately 2,300,000 sq. ft., which will be increased about 200,000 sq. ft., when the buildings now under way are completed.

The number of employees in all the works is over 12,000.

The method of estimating factory cost has been the same as that employed in previous years, but varying percentages have been used to provide for the difference in general manufacturing expenses on standard and special apparatus. The percentages used to cover expenses have been demonstrated by the annual inventory to be sufficient for the purpose.

ENGINEERING.

Engineering work during the past year has been directed towards increasing the efficiency and reducing the cost of our standard apparatus, and the designing of new machinery or modifications in standard machinery to meet special cases.

The demand for generators of large size, from 3,000 to 5,000 hp., has increased, and the average size of electric motors and generators has materially increased.

The 5,000 hp. generators for the new power house at Niagara Falls have been designed and their construction is well under way. This installation, which is expected to be a model of efficiency and simplicity, also includes a switchboard of special design for the control of 30,000 hp.

In many instances it is found to be cheaper to convert the energy of coal into electricity at the mines and transmit it over a wire to the point of consumption, than to transport the coal itself. Successful installations of this character have been made by us during the past year. It is expected that such installations will become more numerous and important, as the distance to which electricity may be economically transmitted is increased.

The number of industrial plants in which electric motors are used for the operation of machinery, such as plate glass, harvesting, cotton, woolen, cement machinery, etc., has largely increased. Some of the larger mills have installed electric motors to an aggregate

capacity of more than 5,000 hp. Users of electric motors are rapidly learning to appreciate the value of electricity, not alone on account of the saving in power following its use, but principally because of the convenience, flexibility, and ready control of the electric system which invariably economizes labor and increases production.

The original and important work done by several of our engineers in the development of a simple and highly effective train control for electric traction is a matter of great satisfaction.

Much of our best engineering skill has been devoted to the difficult problem of providing a simple and safe method of controlling and switching large amounts of electrical energy at high voltage. The result has been signally successful and has been followed by large orders for switchboard installations involving the use of our improved appliances, among which orders may be mentioned one of 50,000 hp. capacity and one of 30,000 hp. for two of the most important electrical enterprises in this country.

There has been a steady improvement in the quality and efficiency of numerous small articles of our manufacture, such as arc lamps, meters, instruments, etc.

We have as heretofore protected our new and important engineering designs as far as practical by applications for letters patent.

The arduous and effective work of our factory managers and engineers deserves our highest praise.

Respectfully submitted,

E. W. RICE, JR.,
Third Vice-President.

SECOND VICE-PRESIDENT'S REPORT.

SCHENECTADY, N. Y., April 20, 1901.

C. A. Coffin, Esq., President General Electric Company.

SIR: The balance sheet and statement of profit and loss, herewith transmitted—with explanation of every item on the balance sheet—include the assets and liabilities and profit and loss accounts of the Edison General Electric and Thomson-Houston Electric Companies (which, for convenience of bookkeeping, are consolidated with those of the General Electric Company) at January 31, 1901; and when "the company" is spoken of, both the above-mentioned corporations are included.

ASSETS.

PATENTS, FRANCHISES AND GOOD WILL.

These were carried in the last annual report at \$2,000,000.00. During the year there were expended for acquiring sundry new patents, in patent expenses and patent litigation..... \$360,258.99

In addition to the above, the patents and good will of various manufacturing companies, including the Siemens & Halske Electric Company of America and of the Marks Enclosed Arc Lamp Company were acquired at a cost of..... 604,673.27

..... 964,931.96

Total patent account before closing the books..... \$2,964,931.96

The bookkeeping profit of the difference between the par of \$3,763,000 debentures and \$3,124,300 (par) of common stock issued therefor, including \$20,642.77 cash to purchase the fractions connected with such issue was credited to patents and good will..... \$618,067.23

Balance now written off..... 346,874.03

..... 964,931.96

Leaving all the patents, franchises, good will, etc., of the company standing on its books at the date of this report, as per balance sheet, at \$2,000,000.00

FACTORY PLANTS.

This account represents the real estate (lands and buildings); machinery (steam and electric plants, tools, appliances, etc.); patterns (including drawings, etc.); and sundries (fittings and other small property accounts) of the

manufacturing plants at Schenectady, N. Y.; Lynn, Mass., and Harrison, N. J.

All are free from mortgage or other lien.

The lands of all three plants now amount to about 180 acres and the total factory floor space of all their buildings is approximately 2,300,000 square feet.

It is worthy of note that the total book value, \$1,858,044.65, of the lands and buildings of all three factory plants is about 80 cents per square foot of the manufacturing floor space in those buildings.

The company's constantly growing business necessitates continuous large expenditures on its plants, to increase their manufacturing capacity by acquiring more land, enlarging old and erecting new buildings, installing new machinery and for general improvements.

On January 31, 1893, the book value of all three factory plants was..... \$3,958,528.21

In the fiscal years 1893 to 1900, both inclusive (over and above all ordinary expenditures for the maintenance and repair of buildings and machinery), additions of lands, buildings, machinery, etc., have been made at a total cost of..... 6,127,770.92

Total book cost of the plants..... 10,086,299.13

To offset depreciation there have been written off during those eight years..... 6,686,297.13

Leaving their book value at January 31, 1901..... \$3,400,002.00

Divided as follows:

Schenectady plant.....	\$2,300,000.00
Lynn plant.....	900,000.00
Harrison plant, lamp factory.....	200,000.00
	\$3,400,002.00

A summary of the changes in this account since the last annual report is as follows:

	Book value Jan. 31, 1900.	Cost of additions during the year.	Written off at the end of the year.	Book value Jan. 31, 1901.
Real estate.....	\$1,858,044.65	\$549,255.10	\$549,255.10	\$1,858,044.65
Machinery.....	1,541,965.85	846,420.28	846,420.28	1,541,965.85
Patents.....	1.00	82,865.46	82,865.46	1.00
Sundries.....	1.00	88,866.99	88,866.99	1.00
Totals.....	\$3,400,002.00	\$1,566,907.83	\$1,566,907.83	\$3,400,002.00

*Include office furniture and fixtures of the factories, horses and trucks, shop fixtures, benches, steam fitting above ground for heating system, sprinkler system for fire protection, electric wiring of buildings, etc.

REAL ESTATE.

(Other Than Factory Plants.)

This account represents the investment in the Edison Building, 44 Broad street, New York City; also a four story brick building covering five lots on the corner of Avenue B and 17th street, New York City, and sundry parcels of land in various places, mostly improved and rented, which have been acquired at various times, chiefly in payment of debts.

All are free from mortgages and will be sold when opportunities offer.

STOCKS AND BONDS.

In the book valuations of stocks and bonds remaining on hand since January 31, 1897, no material changes have been made since they were appraised four years ago. The book value of those not readily salable was then fixed, after careful examination of their worth at that time. Those having a market value are still carried under the price of then reported sales.

Those more recently acquired are carried at cost.

Schedules A and B annexed hereto contain lists of the most important of the company's hold-

ings of stocks and bonds. The total par value of all stocks and bonds owned by the company (other than those carried at one dollar as below explained), is \$13,128,766.20.

They are carried at an aggregate book value of..... \$6,012,191.20

Miscellaneous securities of many underlying, manufacturing, selling and patent owning corporations, and also of street railway and lighting companies, carried at one dollar for each lot, in all..... 109.00

Total book value of all stocks and bonds as per balance sheet..... \$6,012,300.20

I believe the present aggregate realizable value of the foregoing described securities is fully equal to the total amount of which they stand on the books.

Pursuant to the established policy of selling securities which there is no special reason for holding permanently, various stocks and bonds have been sold for cash since the last annual report.

Their total par value was \$1,384,375.00.

They were sold for..... \$1,070,272.03

They had been carried on the books at..... 651,205.23

Profit..... \$419,066.80

The money realized from the above sale of assets was expended to protect and improve existing investments by acquiring (at a cost of \$1,126,416.03) miscellaneous stocks and bonds of the aggregate par value of \$1,794,048.37.

NOTES AND ACCOUNTS RECEIVABLE.

This account represents the total debts now due the company.

They appear in the annexed balance sheet at an estimated realizable value—i.e. from their face, \$10,001,519.48 (which is less than the billed amount of goods shipped during the last 100 days of the year) has been deducted an allowance of \$404,131.95 for possible losses.

I believe this allowance to be a fair one and ample under existing general conditions of business in the country.

Sales During the Year.

The net amount of sales billed to customers during the year exceeded twenty-eight million dollars.

Of some 12,600 regular customers on the accounts receivable ledgers, there were debit balances against 4,900 at the close of the fiscal year.

Collections During the Year.

During the year the cash collections from notes and accounts receivable exceeded twenty-six and one-half million dollars.

On January 31, 1900, the face amount of notes and accounts receivable was \$7,314,930.12, all of which have been settled during the year except \$516,429.19.

	Notes receivable.	Accounts receivable.	Total face values.
Balances, Jan. 31, 1900	\$7,314,930.12	\$6,336,863.44	\$7,314,930.12
Of which there have been settled during the past year.....	767,528.68	6,030,972.25	6,798,500.93
Leaving unsettled or unmatured—originating prior to the current year—56 note accounts and 47 open accounts, on which there are allowed for possible losses \$224,887.85.....	210,588.00	305,891.19	516,429.19
The unsettled and unmatured balances of the current year are.....	1,518,002.56	7,967,087.73	9,485,090.29

Balances, face values, Jan. 31, 1901, exclusive of "dollar" notes and accounts..... 1,728,540.56 8,272,978.92 10,001,519.48

"Dollar" Notes and Accounts.

In addition to the above there are old notes and accounts receivable of two hundred debtors, aggregating \$1,281,087.90, which have been written off to profit and loss except the nominal book value of one dollar for each debtor. They stand on the books at a total of \$200 and are being liquidated gradually. The total amount realized from this class of notes and accounts by settlements made during the past year was \$18,070.78.

Allowances for Possible Losses.

	Notes receivable.	Accounts receivable.	Total.
On debts existing at Jan. 31, 1900, there was then allowed.....	\$72,191.31	\$264,928.51	\$337,119.82
Amount of such allowance absorbed during the current year, in effecting settlements (see foot note).....	32,276.91	164,534.57	196,811.48
Balance of allowance still standing on the old debts.....	\$39,914.40	100,393.94	140,308.34
Above allowance is now increased.....	25,292.07	63,298.44	88,590.51
Total allowance on old debts.....	65,196.47	163,692.38	228,888.85
Allowance for possible losses on unsettled and unmatured balances of the current year.....	16,936.36	158,306.74	175,243.10
Total present allowance for possible losses.....	82,132.83	821,999.12	404,131.95
Deduct total allowance from total face value.....	1,728,540.56	8,272,978.92	10,001,519.48
Book value of all above Add book value of "dollar" notes and accounts.....			200.00
Total book value as per balance sheet.....	1,046,407.73	7,950,979.80	9,597,587.53

In effecting these settlements there were realized \$127,486.87 over last year's book valuations, less \$5,029.06 loss in settling some debts below their appraised value. Net gain above appraised value, \$122,457.81.

WORK IN PROGRESS.

This account does not include outlays for anything in process of manufacture at the factories, but represents expenditures for labor, material, etc., at cost, on 586 uncompleted installations of finished apparatus in progress at various places..... \$1,280,938.60

Less partial payments thereon, received under the terms of the contracts as work progressed.... 226,280.03

Balance as per balance sheet.... 1,054,658.57

None of the estimated profit to be derived from these installations is included in the earnings of the year.

MERCHANDISE INVENTORIES.

These accounts represent actual inventories—counted and valued item by item—of raw materials and goods manufactured and in process of manufacture at the factories; of shipments in transit to storerooms of local offices; of manufactured goods in storerooms of local offices; of materials in local repair shops; and also of all goods on consignment.

Raw materials have been valued at the lowest price paid by the company during the last three months of the fiscal year. The market price prevailing on January 31, 1901, was used where it was lower than the lowest price paid by the company during the said three months.

Active selling finished and partly finished apparatus and supplies were valued at estimated factory cost; inactive or slow-selling apparatus and supplies at about 50 per cent. of estimated factory cost; and obsolete apparatus and supplies at scrap value.

At Factories.

On the above basis the inventories at the factories exceeded their book value. Such excess has not been taken as a profit, but has

been retained as a reserve against possible increased cost of manufacturing in case of further advance in prices of raw material.

At General and Local Offices.

During any fiscal year, goods are taken in and out of local office inventories at the estimated factory cost then prevailing. Consequently, at the close of that fiscal year, there must always be considerable change in book values of finished apparatus and supplies carried over—to adjust their inventory prices to latest estimated factory costs and to provide for losses due to returned articles, cost of repairs, breakages, boxing, reclassifying and writing down the book value of goods no longer quick-selling, etc.

The inventories of apparatus and supplies in all local offices showed a decrease under book value of \$59,030.80, which amount has been charged off to profit and loss.

Office Furniture and Fixtures.

The total appraised value of all office furniture and fixtures, machinery, tools, instruments, etc., in the general and local offices and in local repair shops is \$94,989.22. All these items are carried at a total book value of one-dollar.

Consignments.

Finished apparatus for novel uses has been delivered to various concerns subject to purchase if its operation is successful. The greater part of the consignment account represents such contingent sales, and the remainder represents apparatus on exhibition or loaned to regular customers for temporary use by them.

All such shipments are charged to this account at estimated factory cost. Their total is \$127,805.49. Less 50 per cent. allowance for depreciation 63,902.74

Net book value of consignments as per balance sheet... \$63,902.75

LIABILITIES.

The company has no note payable, nor is there under discount any paper bearing the company's indorsement or guaranty.

Since January, 1895, the company has not borrowed any money, nor at any time since that date has its credit been used either by issuing notes, indorsing customers' paper for discount or lending its name in any way; but by adhering to its established policy of maintaining sales on a basis of cash or short credit to desirable customers all purchases have been paid for in cash.

DEBENTURES.

At January 31, 1900, there were outstanding \$5,300,000. There were purchased for cash (average price \$1,270.83) during the year 3,000 \$5,297,000

All the debentures are on their face exchangeable for stock at the option of their holders, at the rate of \$100 of stock for \$120 of debentures. During the year the holders of 3,763 debentures surrendered them and 31,243 shares of stock were issued therefor 3,763,000

Leaving debentures outstanding at this date \$1,534,000

ACCRUED INTEREST ON DEBENTURES.

This account, as its name implies, is the full amount of 5 per cent. interest accrued to January 31, 1901, on the company's \$1,534,000 outstanding debentures.

UNCLAIMED DIVIDENDS.

This account represents the full amount unpaid on all dividends declared and payable to January 31, 1901, inclusive—the addresses of a few stockholders being unknown.

ACCOUNTS PAYABLE.

This account includes all unpaid audited indebtedness.

At the close of business on January 31, 1901, the unpaid vouchers on hand—none of which was then due under the terms of purchase—amounted to \$78,428.57

Between January 31 and February 26, 1901, the date of closing the general books, additional liabilities belonging to the past year were audited, amounting to 742,021.78

Total as per balance sheet \$820,450.35

The amount of unpaid vouchers carried over monthly—by keeping the books, other than the cash book, open a sufficient time to include each month's obligations in that particular month—has averaged during the year about \$920,000. Respectfully submitted,

J. P. ORD,

Second Vice-President.

Amount brought forward.....	\$72,848.83
Union Electric Co., pref., Dubuque, Ia.....	122,500
com.....	123,500
United Elec. Securities Co., com., Boston.....	500,000
United Gas & Elec. Co., Dover, N. H.....	62,500
Utica, N. Y., Belt Line Street Ry. Co., pref.....	50,000
Total.....	\$8,182,833
Total book value.....	\$8,182,833
Average per cent. of book value of above named stocks to par 99.98.	

(Schedule B.) BONDS.

CORPORATE NAME.	PAR VALUE.
Anniston, Ala., Electric & Gas Co.....	98,000
Asheville, N. C., St. Railroad Co.....	27,000
Asheville & Biltmore, N. C., St. Ry. & Trans. Co.....	85,000
Ashland, Wis., Light, Power & St. Ry. Co.....	110,000
Brush Electric Co., Cleveland, O.....	168,000
Columbus, Ga., R.R. Co.....	48,000
Charleston, S. C., Coal & Ry. Gas & Elec. Co.....	70,000
Citizens El. Lt. & P. Co. rec'd's off's, Houston, Tex.....	60,000
Edison Electric Co., Los Angeles, Cal.....	26,000
Geneva, N. Y., Pr. & Lt. Co.....	49,000
Jackson, Mich., Light & Power Co.....	32,000
Little Rock, Ark., Edison Elec. Lt. & Pr. Co.....	31,000
Little Rock, Ark., Trac. & El. Co. (2d mortg).....	77,000
Madison, Wis., Elec. Railway Co.....	22,000
Montana Power Transmission Co., Butte, Mont.....	8,000
Northern Ry. & Imp. Co., New Whatcom, Wash.....	45,000
Public Works Co., Bangor, Me.....	222,715
Rutland City, Vt., Electric Co.....	98,000
Sacramento, Cal., Electric, Gas & Ry. Co.....	297,000
Schenectady Railway Co., Schenectady, N. Y.....	216,000
Seneca Edison Co., Seneca Falls, N. Y.....	80,000
Tacoma, Wash., Railway & Power Co.....	423,000
United Gas & Electric Co., Dover, N. H.....	20,000
Winona Railway & Light Co., Winona, Minn.....	36,000
Total.....	\$2,218,715
Total book value.....	\$1,569,418.99
Average per cent. of book value of above named bonds to par 70.73.	

Consolidated Balance Sheet of January 31, 1901.

ASSETS.	LIABILITIES.
Cash.....	\$2,378,688.22
Stocks and bonds.....	\$6,012,300.20
Real estate (other than factory plants).....	522,452.80
Notes and accounts receivable.....	9,597,887.58
Work in progress.....	1,054,688.57
	\$17,186,999.10
Merchandise inventories:	
Factories.....	\$7,061,751.17
Gen'l and local offices.....	865,325.07
Consignments.....	68,902.75
	7,990,979.99
Factory plants.....	3,400,002.00
Patents, franchises and good-will.....	2,000,000.00
	5,400,002.00
	\$82,961,688.91
5 % gold coupon debentures.....	\$1,584,000.00
Accrued interest on debentures.....	12,788.88
Accounts payable.....	820,450.35
Unclaimed dividends.....	8,749.50
	\$2,425,988.73
Capital stock:	
7 % cumulative preferred.....	\$2,551,200.00
Common.....	21,400,800.00
	\$23,952,000.00
Surplus.....	6,629,180.64
	\$32,581,180.64

Consolidated Profit and Loss Account of January 31, 1901.

EXPENSES.	EARNINGS.
Cost of sales.....	\$28,585,212.78
Interest on debentures.....	240,040.88
Dividends paid:	
On preferred stock.....	178,584.00
On common stock.....	1,449,665.00
	1,728,249.00
Surplus at commencement of year.....	2,858,080.52
Undivided earnings during the year now added to surplus.....	4,276,150.12
Balance January 31, 1901 (surplus).....	6,629,180.64
	\$32,182,682.73
Balance Jan. 31, 1900 (surplus).....	\$2,858,080.52
Sales.....	\$29,783,276.75
Royalties and sundry profits.....	298,868.66
	29,082,145.41
Dividends and interest received on stocks and bonds owned.....	\$282,041.25
Interest and discount.....	96,901.88
	\$378,943.13
Profit on sales of stocks and bonds.....	\$419,086.81
	\$382,182,682.75

(Schedule A.) STOCKS.

CORPORATE NAME.	PAR VALUE.
Australian Gen. Elec. Co., Schenectady, N. Y.....	\$50,000
Augusta, Ga., Railway & Electric Co.....	240,000
Buffalo, N. Y., General Electric Co.....	181,500
British T. H. Co., Ltd., London, Eng.....	168,750
Compagnie Electricite T. H. de la Mediterranee, Paris.....	118,175
Compagnie Francaise, etc., T. H., Paris.....	50,000
Chattanooga, Tenn., Light & Power Co.....	150,000
Cincinnati, O., Edison Electric Co.....	266,600
Consolidated El. Lt. Co., Birmingham, Ala.....	314,500
Cleveland, O., Elec. Ill. Co., com.....	187,000
Chicago, Ill., Edison Co.....	190,300
Columbus, O., Edison Light Co., pref.....	21,100
com.....	30,200
Edison Light Co. of Grand Rapids, Mich.....	24,000
Edison Electric Co., pref., New Orleans, La.....	1,768,800
com.....	1,865,000
Jackson, Mich., Light & Power Co.....	25,000
Mexican Gen. Elec. Co., Schenectady, N. Y.....	50,000
New Omaha, Neb., T. H. Electric Light Co.....	288,750
Northern Ry. & Imp. Co., N. Whatcom, Wash.....	58,100
Otis Elevator Co., Yonkers, N. Y., pref.....	60,000
com.....	60,000
Paterson & Passaic, N. J., Gas & Elec. Co.....	80,000
Pueblo, Col., Traction & Electric Co.....	146,104
Public Works Co., Bangor, Me.....	50,000
Seattle, Wash., Electric Co., pref.....	92,000
com.....	100,000
Schenectady, N. Y., Realty Co.....	31,200
South Jersey Gas, El. & Trac. Co., Trenton, N. J.....	38,000
Sacramento, Cal., Gas & Ry. Co.....	87,700
Seneca Edison Co., Seneca Falls, N. Y.....	800,000
Schenectady, N. Y., Railway Co.....	60,000
South African Gen. El. Co., Schenectady, N. Y.....	25,000
South American Gen. El. Sur. Co., Schenectady.....	751,400
Tacoma, Wash., Railway & Power Co.....	81,664
Union Elektrizitaets Gesellschaft, Berlin, Ger.....	
Amount carried forward.....	\$72,848.83

REPORT OF THE ACCOUNTANTS.

New York, April 20, 1901.

To the Board of Directors of the General Electric Company.

We have examined the account books and vouchers of the General Electric Company, the Edison General Electric Company, the Edison Electric Light Company, and the Thomson-Houston Electric Company, for the year ending January 31, 1901, and have verified the consolidated profit and loss account and the balance sheet published herewith.

The vouchers covering the whole of the expenditures for the year are full and clear. The bookkeeping is sound in principle and very accurate in detail.

The valuations of assets used in determining and verifying the profits, and which appear in the balance sheet, are made with the same care as in previous years.

Our examination of the merchandise inventories has satisfied us that the method of valuing these described in the report of the Second Vice-President, has been adhered to throughout. The excess of inventory value

over book-value constitutes in our opinion a sufficient provision against any contingency in connection with inventories valued in so careful a manner, and in a business so active as that of your company.

The valuation of accounts and notes receivable appears to us to be made in the same manner as in previous years, and heretofore the actual realization of these assets has exceeded the valuation in the published accounts.

The remarks upon the valuation of accounts and notes receivable practically apply to the valuation of stocks and bonds owned. The conversion of these into cash is of course more gradual, but in the meantime the total valuation is justified by the volume of the interest and dividends received.

Comment on the balance sheet valuation of factory plants and patents is scarcely needed. The additions to these assets during the past year, which have been written off to leave the valuations the same as at January 31, 1900, and which are set out more fully in the report of the Second Vice-President, amount to almost half the present valuation of these assets in the balance sheet. This fact, together with their obvious extent and earning power, abundantly establishes the safety of the valuations of plants and patents.

The same care as heretofore has been used to include in the balance sheet all known existing liabilities.

PATTERSON, TREELE & DENNIS,
Certified Public Accountants.

THE PAN-HELIO-MOTOR.*

BY R. M. W.

The other day I called upon Dr. Halver, of Washington, to hear all about his new prime mover, the "Pan-helio-motor." The mere name of this machine is to me a source of great delight, the syllables seeming to issue from one's lips like a song. There is none of the harshness that is to be found in such words as "automobile" or "traction-engine" or "liquid air motor," to say nothing of some German machines with names like—well, perhaps they are better left undescribed. But "Pan-helio-motor!" It is a chant, a carol; try it for yourself the next time you are quite alone, and you'll agree with me. However, that is a digression, and I must proceed to the description of the machine itself and of what it can do. I was shown at once into Dr. Halver's "backyard," which was a large and well laid-out garden of about two acres in extent; but this, all the same, is a "backyard" in America. The Doctor was rather taken aback at my sudden appearance, as he was in rather scant attire—in fact, he had nothing on but a bathing suit and a shining silk hat. I introduced myself, and after a few minutes' chat I felt quite at home.

"You must feel the heat a good deal Doctor," said I, as a sort of apology for the fact that I could not keep my eyes off his somewhat strange rig-out.

"Yes," said the Doctor, "I do feel it a good deal, although I have discovered the proper way to dress for this kind of work. You are no doubt surprised to see me wearing this silk hat?"

I signified that I was, somewhat.

"Well," he explained, "this hat is such a perfect reflector that it throws off and scatters

From "Lighting," London, Eng.

the sun's rays from my head in the same way that my machine collects and concentrates them. I had a complete suit made out of old silk hats, but, although it was very cool, it was not of a sufficiently flexible material to give any great degree of comfort in wearing it, so I fell back upon this old bathing suit which I used at Manhattan last season. I find it answers very well, although it's not anything like so 'dressy' as the silk hat suit."

I perceived at once from the foregoing conversation that I had a genius before me, and became impatient to get at the real object of my visit, the pan-helio-motor itself. The Doctor was very quick to notice my impatience, more by the acuteness of his observation than from the fact that I had unintentionally kicked him several times on his bare shins in my restlessness to get to the bottom of the "yard," where, I could see, the apparatus was erected. At last we arrived at the wonderful machine itself, and I began to ask the Doctor a few leading questions, as he showed that diffidence in explaining his discovery which is so common to all inventors, especially American inventors.

"What are the main features of your machine?" I asked.

"The main features," he replied, "is the enormous amount of heat which I can generate with my apparatus."

"Excuse me," I remarked, "but does not the sun generate the heat, your apparatus merely collecting it and concentrating it upon a particular spot?"

The Doctor seemed a little ruffled at my question.

"I was not aware," he replied, "that you were a scientific man, or I should never have allowed you to see my apparatus. I never explain it to scientific men."

I thought this was a very safe line for the Doctor to adopt; I did not say so, but proceeded to disclaim any special scientific knowledge on my part. Somewhat reassured, the Doctor proceeded to explain how his apparatus could reflect the sun's rays on a focusing spot, and burn down a rocky mountain without so much as lighting a match. I was particularly struck by the great usefulness of a machine which could perform this miracle, which the Scriptures set pretty high up on their list of difficult things to accomplish.

"Do you find much demand for the burning down of rocky mountains around here?" I asked.

"In the meantime," he replied, "business in the rocky mountain line is not very brisk, but I expect a large number of orders shortly when my invention becomes better known to the proprietors of such nuisances as rocky mountains."

"Your invention is bound to prove most useful to railway engineers," I took the liberty to remark. "For instance, the burning of a hole through a mountain for a railway line to run through would be quite a simple matter, I suppose."

"Oh! certainly," said the Doctor, "the merest trifle."

"Is it the case," I asked, "that the melting of silver coins, glass tumblers, diamonds, etc., is performed almost instantaneously by your machine?"

"Yes," said the Doctor, removing his silk hat for a moment to mop his brow with a loose corner of the bathing suit, "all these and many other operations of equal usefulness are easily

done by the pan-helio-motor. The bricks I can make by my heat are so hard that one of them would smash a navy's pick into a thousand pieces if he got in a good blow at it. This is a discovery invaluable to electrical engineers, for instance, who had given up looking for a material which would resist a pick. To protect their mains all they will have to do will be to put a layer of my bricks over the cables, and I guarantee that the average navy will give up trying to get through to the wires after he has splintered his fourth pick."

I at once appreciated this point, as I am acquainted with a superintendent of electric mains, and have heard him discourse most forcibly on this very subject more than a few times. I was so grateful to the Doctor for giving my friend a chance of leading a less sulphurous existence in the future that I asked him on the spot to join me in a little refreshment at the nearest bar. He thanked me cordially, but refused, on the ground that his costume was apt to attract more public notice in the streets than could be desirable, even to an inventor. I at once saw the difficulty in which he was placed and postponed the adjournment to a more suitable occasion.

"Now, for a few experiments," said the Doctor, and grasping the controlling levers which actuated the reflecting mirrors, he directed the concentrated heat on a soaking wet plank of wood, and immediately the plank burst into flame. By regulating the heat to a slightly less intensity, about a dozen holes were bored through the plank before I had time to say 'cocktail.'

"What do you think of that?" said the inventor.

For a moment or two I stood speechless with wonder, but the Doctor reduced his heat by a few thousand degrees and playfully burned a small hole about three-sixteenths of an inch in diameter and about one-half inch deep in the calf of my left leg, which quickly wakened me out of the brown study into which I had fallen.

"Wonderful," I replied, carefully plugging up the hole with a square piece of lead pencil so that I might have something tangible to show my friends when telling them of my strange experiences. The Doctor then gave me an inkling of what will be the order of things when his sun-motor becomes generally used. Coal will probably be a thing of the past as a fuel, as the pan-helio-motor will be very much cheaper, since it enables the heat of the sun to be controlled by a couple of levers. A pan-helio-motor in our backyard will enable us to do away with coal-bins, ash-bins and wood-sheds, as coal fires will be quite out of date. The absence of the coal merchant's bill will be a pleasing feature of every home. In order to provide for the time when the sun is not available, the Doctor has invented a heat reservoir, but the principle of this reservoir is, I understand, a secret, which the inventor guards so jealously that he has not patented it, showing again that Dr. Halver "knows a thing or two." The heat is drawn off "like beer from a cask" from the tank containing the heat storing minerals. "Of course," the Doctor explained to me, "it is not absolutely necessary to use the heat reservoir, as the heat can be used to generate steam and drive dynamos, when the power so obtained can be stored by storage batteries. This, of course, would be quite a cheap method, but not a bit cheaper than storing the heat itself by means of the reservoir." From some remarks my friend, the main

superintendent, had let fall in my hearing a few days before I had my doubts about the cheapness of the electrical method of storing. I thought it better, however, to say nothing of this to Dr. Halver, remembering his antipathy to anyone having, or pretending to have, scientific knowledge.

I made one remark to the Doctor, however, before leaving him, which I could see had set his inventive brain on a new tack.

"This invention," I said, "is a splendid idea where there is plenty of sunshine, but what about the countries where there are five days of rain to one of sunshine? If you could invent a 'pan-pluvio-motor' which would gather up and concentrate all of the energy possessed by the falling drops of rain, and turn them to a useful purpose, you would confer a blessing on the people of Great Britain, for instance, which would cause them to have a bronze statue erected to you in almost every town in the world."

"I'll think it over," said the Doctor.

I left him thinking, an interesting figure, with his silk hat crushed down over his ears, and the loose edges of his bathing suit flapping gently in the breeze.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 25.

THE TELEPHONE AND TELEPHONE PRACTICE. (Concluded.)

Private telephone systems for factories, warehouses and offices have become quite a feature in the telephone industry, so much so that a number of manufacturing companies have devoted themselves almost entirely to the production of apparatus for that purpose.

A great deal of trouble is being experienced by the users of such systems and it is a very small percentage of the plants installed which give entire satisfaction and continue to do so. In four cases out of five the trouble is in the installation and not the fault of the instruments. There are very few instruments on the market but what will work entirely satisfactory if properly installed and are allowed to work under the conditions in which they

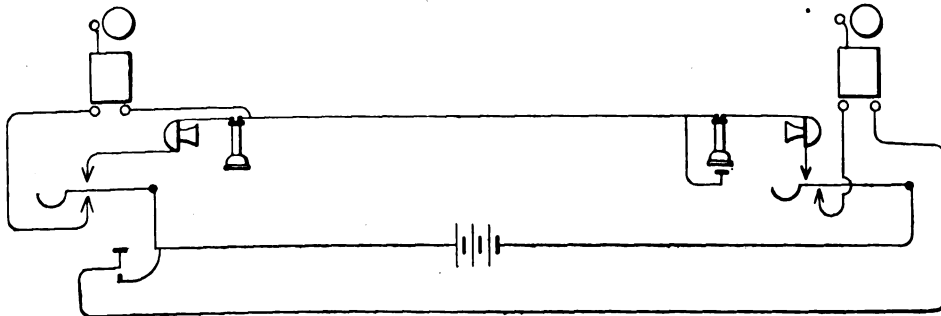


FIG. 1.

are intended. Very often the blame is placed on the transmitters, in fact, it is a usual thing for this to be done. That is nonsense, however, because any of the standard make of transmitters give excellent results if properly installed and operated.

When installing an interior or isolated plant the following points should be remembered:

When cable is used, always use cable which is made up of twisted pair conductors.

Never use what is known as "parallel" or "telegraph" cable for telephone work. It has no transposition of conductors.

It is advisable to use twisted pair wire in all telephone work.

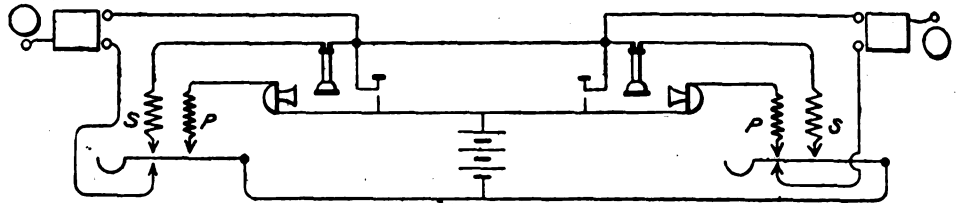


FIG. 2.

Use the same precaution installing telephone cable that is required in electric light work.

Never fasten wires with double pointed tacks.

Solder all joints.

Do not use too heavy wire. It is not necessary and is clumsy to connect to instruments.

Connect instruments up the way they are intended to operate. Never use local battery instruments on common battery work. They will not give satisfaction.

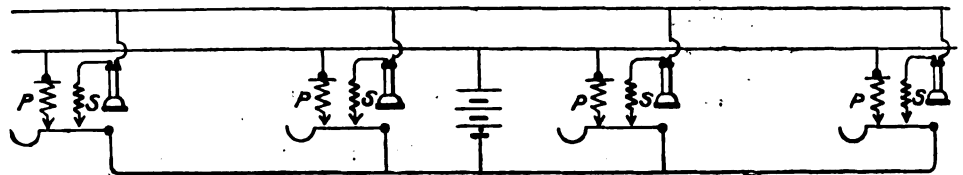


FIG. 3.

When receivers are connected direct in the talking circuit, as in some common battery systems, they should be wound to low resistance. High resistance receivers are used with perfect satisfaction in secondary circuits only.

the button is closed, cutting out the resistance of the transmitter and receiver.

Fig. 2 illustrates a two station line with two local battery instruments operating on an individual battery. When a button is pressed

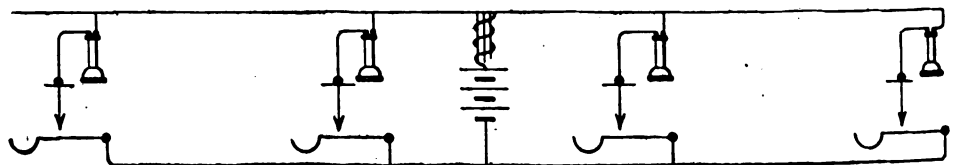


FIG. 4.

On intercommunicating local battery work of more than two instruments, do not use the same battery for feeding the transmitters, except when a storage battery is used. "Cross talk" will exist if you do.

at either station, both bells ring in multiple. This is not a satisfactory equipment except on a short line of not more than two or three hundred feet.

Fig. 3 shows how the same battery may be used for supplying a number of local battery sets, provided they are placed on one talking circuit. In a case of this kind, with a number of instruments on a circuit, it is not advisable to use the same battery for operating vibrating bells, for if a bell is being rung when the instruments are being used the disturbance on the battery will very much interrupt their working.

Fig. 4 describes the method of connecting common battery instruments on one talking circuit. The instruments are connected in multiple with the battery, which is fed to the circuit through a retardation coil. In such cases as this, if the same battery is used for ringing vibrating bells, the connections must be made back of the retardation coil. If this was not done the inductive spark from the effect of the coil would burn the contacts on the bells and also it would be impossible to talk over the circuit if the bells were being used.

On the intercommunicating systems oper-

ing with a common return wire it is practically out of the question to try and prevent "cross talk." On large systems it is not good practice to adopt the common return method. Most of the recognized systems provide for a metallic circuit multiple of every instrument to each instrument.

For isolated plant work, common battery systems give much the best results.

Article No. 26 will be entitled "Suggestions for the Telephone Inspector."

AN ELECTRIC FURNACE FOR THE MANUFACTURE OF CALCIUM CARBIDE.

On April 16th there was issued from the United States Patent Office a patent covering a new type of electric furnace. This fact in itself would not have caused any special comment, for patents for improvements in electric furnaces are quite common, but when it became known that it was the long expected and much talked of carbide furnace of the Columbian Carbide Company, electricians throughout the country became at once highly interested. It would seem to be the consensus of opinion so far that a successful type of continuous furnace has at last been reached. The Columbian Carbide Company has been secretly experimenting for some time past in the manufacture of calcium carbide and it is said also has other processes, the result of their long research, which will appear from the Patent Office shortly.

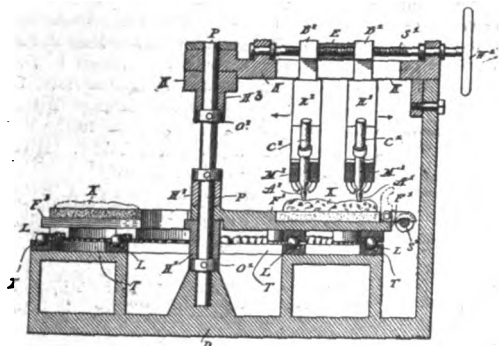


FIG. 1.

The furnace is the invention of Francis Jarvis Patten and a description of its principal features should prove of interest. The furnace is of the "open-hearth" type, the electric arcs playing downward against an open furnace-floor, the process being plainly open to view. It is in a sense a multiple furnace, as there are two or more furnace-floors.

Referring to Fig. 2, the ground plan is of a circular form, and the furnace floors or hearths $F^1 F^2 F^3$ are sectors of the circle of about 70 degrees of arc each, thus leaving 50 degrees of arc open space between the three floors. These hearths or "furnace floors," as the inventor styles them, are revoluble about a central post or supporting-axis P , Figs. 1 and 2, revolving on a hinge $H^1 H^2$, Fig. 1, which surrounds the supporting-post, and further supported at the outer rim of the floor by resting upon ball-bearings LL , that are held in a pair of concentric circular grooved tracks TT , Fig. 1, which give the furnace-floor substantial support. All the floors can be swung completely around the circle; but there are three working positions to which each floor in turn is successively removed, chasing each other from one stage of operation to the next. Two of these positions are working positions

for the electric arcs, while the other has no arcs and is a charging position. From the charging position the floor is moved, with its charge of lime and coke, to the next position, where the preliminary heating is done with a number of arcs of comparatively low power. This done the floor moves to the third position, where the actual smelting is done, and then to the first position, where the product is re-

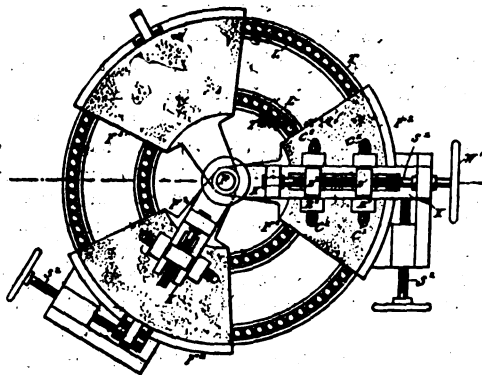


FIG. 2.

moved and a new charge is placed on the floor. In each of the arc working positions the floor on arrival at the central line is clamped to a tangent screw apparatus S^1 , Fig. 2, by means of which the floor may be swung backward or forward circumferentially by a distance of about half its breadth.

The arrangement of the carbons is shown in Fig. 1. Two or more sets are suspended from a swinging arm K over the two working floors. These arms or carbon-carriers are revoluble about the central post P just the same as the floors and can be turned circumferentially at will to any position; but when the floor is in the working position the arm or carrier K is clamped centrally over the floor and is not moved circumferentially while the arcs are working. Two sets of carbons C^1 and C^2 are shown supported on the arm K , which has a vertical slot along its middle line. In this slot the actual carbon-holders are fixed in such a way that they can be moved along the arm to

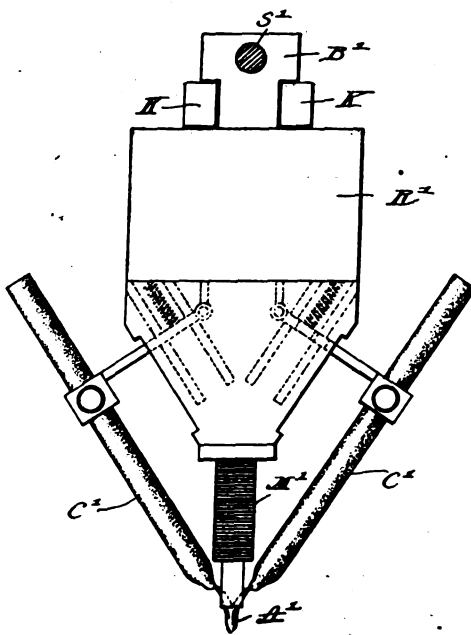


FIG. 3.

or from the central post radially. This movement is effected by turning the hand-wheel W^1 and screw S^1 , which, being itself fixed and passing through the screw-threaded blocks $B^1 B^2$

at the tops of the carbon-carriers causes the carbons and their arcs to be traversed radially over the furnace-floor. This arrangement is plainly seen in Figs. 1 and 3. Thus there are two movements at command—a circumferential one of the furnace-floor and a radial one of the arcs. Evidently by using both the arcs can be placed immediately over any particular spot of the floor, and thus made to act upon any part of the charge it may be desired to reach.

The carbon system and their arrangement are shown in Fig. 3. Two carbons in each set are inclined to each other in such a position that the arc between them is just over the furnace-floor. Between the carbons, with its poles across or bridging the arcing space, is a powerful electromagnet $M^1 M^2$, Fig. 1, and this magnet when excited blows the arc down, as shown, in a pointed and vertical stream of flame against the charge X of lime and coke below and which the carbons themselves do not touch. In the boxes R^1 and R^2 , Figs. 1 and 3, is placed suitable regulating mechanism for feeding the carbons as they are consumed.

The essential features of the furnace, then, are the multiple furnace floors horizontally revoluble about a common center, the multiple carbon system for two of the three floors, the

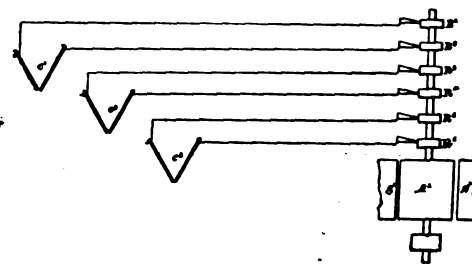


FIG. 4.

carbons being movable radially at will in a horizontal direction parallel to and just over the furnace-floors, and the magnetically-deflected arcs directed from the carbons downward against the charge on the furnace-floors.

When using three arcs over each floor, tri-phase alternating currents are used, one of the three currents being through each pair of carbons, as indicated by the diagram of circuits in Fig. 4. In which each of the separate pairs of carbons $C^1 C^2 C^3$ is given one of the independent alternating currents of the triphase currents delivered by the dynamo (shown in the diagram) by the field-poles $N^1 S^1$, armature

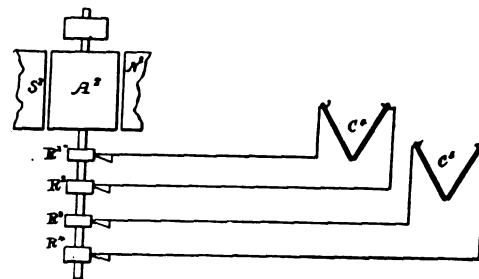


FIG. 5.

A^1 , and terminal rings R^1 to R^4 . When using two carbons, biphasic alternating currents are used, one current going through each pair of carbons, as indicated by the diagrams of circuits in Fig. 5. The system is thus exceedingly flexible, as it enables one to use an ordinary biphasic alternator for the source of electricity, and then passing the currents from it through a suitable transformer. The volts and amperes are changed to suit the requirements of the work.

Committee on Standardizing.

The Committee on Standardizing of Street Railway Equipment, appointed at the recent meeting of the Executive Committee of the American Street Railway Association, has begun active work with a view of presenting a comprehensive report on the subject at the annual meeting of the Association in October next. T. E. Crossman has been appointed secretary to the committee, and he, in conjunction with the members of the committee, will visit some of the leading manufacturers of street railway equipment to ascertain their views on the subject of standards. The members of the committee are John R. Graham, Lynn and Boston Railroad Company, Boston; N. H. Heft, Meriden Electric Railroad Company, Meriden, Conn.; Willard J. Hield, Twin City Rapid Transit Company, Minneapolis; C. F. Holmes, Metropolitan Street Railway Company, Kansas City; Frank G. Jones, Memphis Street Railway Company, Memphis. They request that all who are interested in the subject will correspond with the secretary of the committee, whose address is 1829 Park Row Building, New York, prior to May 20, at which time a meeting of the committee will be held in Buffalo.

A Novel Scheme for Pan-American Exhibitors.

Mr. W. Jac. Marland of 132 Nassau street, New York City, informs us that as the Curator of a Collective Electric Exhibit Section, Electricity Building, Pan-American Exposition, it will be his duty to take care of exhibits for firms desirous of showing their goods, who do not care to go to the expense of an individual exhibit, and in this connection, he is prepared to make arrangements to allot space in this Collective Section for sums of \$25 and over, according to the amount of space required and current consumption of the exhibit; this includes the caring for and demonstration of the exhibit and the handling of any circular matter.

The following firms have arranged with Mr. Marland to represent and exhibit for them during the Exposition: Charles J. Bogue, Edison-Johnson Electric Mfg. Co., Dunn-Martin Electric Co., Thomson Electric Welding Co., H. C. Cushing, Jr., Prentiss Clock Improvement Co., Power Installation Company, F. B. Sage & Bro., The Diamond Arc Lamp Co., Harold P. Brown, Emile J. Fardie, H. P. Cameron Electric Mfg. Co., William Roche, Smith & Hemingway, Parsell & Weed, Standard Welding Co., Electric Contract Co., Queen & Co., Boston Extension Tap Co.

It will be readily appreciated that the specialties of these firms will make an elegant exhibit and Mr. Marland's Collective Section will be one of the great attractions of the Electricity Building.

Mr. Marland's idea is quite unique and original, as he proposes to have each specialty work one upon the other so far as prevailing conditions will permit.

Legal Decision on a Stanley Patent.

JUDGE COXE, in the United States Circuit Court, Northern District of New York, has just handed down a decision in favor of the complainant in a suit brought by the Westinghouse Electric & Manufacturing Company against the Saranac Lake Electric Company, which uses electrical transformers manufactured by the Stanley Electric Company of

Pittsfield, Mass. The decision sustains the patent of Stanley, which had been assigned to the Westinghouse Electric & Manufacturing Company. The inventor, Stanley, at the time of making the invention was associated with the Westinghouse Company, and it is understood that the patent covers practically all commercial systems of alternating current distribution for electric lighting and power.

Not Badly Injured by Fire.

We have received the following card from the B. F. Sturtevant Company, Jamaica Plain, Mass.: "The fire which visited our works on Sunday, April 14, injured only our engine and electrical departments. Our drawings, correspondence and office records are all intact. The entire blower, heater, forge, galvanized iron and shipping departments with the foundry, pattern shop, etc., are in full operation and shipments going forward as usual. Tools are on the road and arrangements already made for immediately re-equipping the engine and electrical departments. We are prepared to take orders for engine and electrical work, and fill same within reasonable time."

PERSONAL MENTION.

Mr. Joshua Rhodes was recently made president of the Pittsburg, Pa., Consolidated Traction Company, and W. Kesley Schoepf succeeds him as vice-president.

INCORPORATIONS.

The Thames Electric Company, New London, Conn. Capital stock, \$2,500.

The Electric Railroad Construction Company, Perth Amboy, N. J. Capital stock, \$100,000. Incorporators: Sidney Riddlestoffer, A. Clayton Clark and William A. McCoy.

The Electrical Specialty Company, Baltimore, Md. Capital stock, \$1,000. Incorporators: Augustine M. Hopper, Cecil N. Money, Edwin W. Poe, Jesse Slingluff and Carroll T. Bond.

The Ticonic Construction Company, Waterville, Me.—to carry on general contracting business in electric light, power and traction plants, water plants, etc. Capital stock, \$10,000. Officers: President, Everett M. Stacy; treasurer, Horace Purinton, both of Waterville.

The Hudson River Electric Company, Albany, N. Y.—to construct dams across the Hudson River in Saratoga, Warren and Washington Counties and elsewhere, and to furnish light, heat and power to cities, towns and villages in Saratoga, Washington, Fulton, Montgomery, Rensselaer, Albany, Schenectady, Essex, Clinton, Franklin and other counties. Capital stock, \$1,000,000. Directors: C. H. Pedrick, Jr., and J. M. Warren, Spier Falls; Henry W. Williams, Robert de Long and F. G. Baker, Glens Falls.

ELECTRICAL PATENT RECORD.**LETTERS PATENT ISSUED APRIL 23, 1901.****ELECTRIC RAILWAYS AND APPLIANCES.**

672,658. Trolley for Electric Railway Cars. August Schneider, Lexington, Ky., assignor of one half to Frederick R. Toe Water, same place. Filed Oct. 15, 1900.

672,741. Electric-Railway Trolley. Charles H. Myers, Buffalo, N. Y. Filed Nov. 30, 1897. Renewed Sept. 8, 1900.

672,831. Trolley. William W. Hoffman and Francis W. Powers, West Lafayette, Ind. Filed Oct. 1, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

672,451. Electric-Light Vacuum-Tube. Daniel M. Moore, Newark, N. J., assignor to the Moore Electrical Company, New York City. Filed March 28, 1898.

672,452. Electric-Light Apparatus. Daniel M. Moore, Newark, N. J., assignor to the Moore Electrical Company, New York City. Filed April 15, 1898.

672,489. Supporting Device for Electric Lamps. Edwin J. McAllister, Almon D. Page and Louis C. Werner, Newark, N. J., assignors to William Farley Brewster, New York City. Filed Jan. 11, 1901.

672,597. Electric-Arc Lamp. Albert De Puydt, Liege, Belgium. Filed Dec. 4, 1900.

672,639. Conductor and Contact for Electrical Glow-Lamps. Julian A. Halford, Bayswater, Eng., assignor to the

Electric Lighting Boards, Limited, London, Eng. Filed Jan. 21, 1901.

672,642. Electric Incandescent Lamp. Louis J. P. Hollub and Henry Mignol, Paris, France. Filed Nov. 8, 1900.

672,770. Electric Arc Lamp. Charles Holmök and Julius Holmök, Cleveland, O. Filed Jan. 21, 1901.

672,877. Electric-Lighting System for Railway-Cars. James W. Guillott, Chicago, Ill., assignor to George W. Cass, trustee, same place. Filed May 15, 1896.

672,878. Electric-Lighting System for Railway-Trains. James W. Guillott, Chicago, Ill., assignor to George W. Cass, trustee, same place. Filed July 20, 1896.

ELECTRICAL MACHINERY AND APPARATUS.

672,513. Electric Switch. James Reid, Jr., Watervliet, N. Y., assignor to the Consolidated Car Heating Company, Albany, N. Y. Filed Jan. 28, 1899.

672,583. Electrical Switch. William F. Bossert, Utica, N. Y., assignor to the Bossert Electric Construction Company, same place. Filed Dec. 4, 1900.

672,440. Automatic Booster in Connection with Multiple-Wire-Systems. John S. Highfield, St. Helena, Eng. Filed Feb. 2, 1901.

TELEPHONES AND TELEPHONE APPARATUS.

672,546. Telephone Metering System. Donald M. Bliss, Lowell, Mass., assignor to the Automatic Telephone Meter Company of New Jersey. Filed Nov. 27, 1899.

672,621. Telephone Transmitter. Charles C. Hughes, Baltimore, Md. Filed April 14, 1900.

672,162. Desk-Telephone. Albert K. Andriano, San Francisco, Cal., assignor to the Automatic Interconnecting Telephone Company, Incorporated, same place. Filed Sept. 23, 1899. Renewed Sept. 17, 1900.

MISCELLANEOUS.

672,449. Electrical Conductor. William A. Markey, Saginaw, Mich., assignor to Emmet T. Bowen, same place. Filed Aug. 31, 1900.

672,466. Adjusting Mechanism for Rolling Mills. Richard Wayland-Smith, New York City. Filed Oct. 1, 1900.

672,503. Accumulator-Battery. Pascal Marino, Brussels, Belgium. Filed April 10, 1900.

672,589. Interior-Conduit Capping. William F. Bossert, Utica, N. Y., assignor to the Bossert Electric Construction Company, same place. Filed Feb. 13, 1901.

672,601. Tapping Device for Electric Furnaces. Oscar Frolich, Steglitz, near Berlin, Germany. Filed May 15, 1899.

672,608. System of Electric Distribution. Albert F. Hubbard, Belleville, N. J., and Rufus N. Chamberlain, Depew, N. Y., assignors to the Gould, Storage Battery Company, New York City. Filed March 13, 1901.

672,604. Commutator-Brush and Brush Holder. Robert Landell, New York City. Filed Oct. 10, 1900.

672,606. Insulated Railroad Rail Joint. George A. Weber, Stamford, Conn., assignor to the Weber Railway Joint Manufacturing Company, New York City. Filed Dec. 7, 1900.

672,626. Railway-Signal. Jonathan D. Price, Aurora, Ill., assignor to Miller Signal Company, Chicago, Ill. Filed April 11, 1900.

672,629. Telautograph. George S. Tiffany, Highland Park, Ill., assignor to the Gray National Telautograph Company, Richmond, Va. Filed Aug. 26, 1898.

672,630-672,631. Telautograph. George S. Tiffany, New York City, assignor to the Gray National Telautograph Company. Filed Nov. 22, 1900.

672,637. Process of Treating Zinc-Bearing Ores for Obtaining Zinc, etc. Sherard O. Cowper-Coles, London, Eng., assignor to the Cowper-Coles Metal Extraction Syndicate, Limited, Melleenar Haecyle, Eng. Filed July 23, 1898.

672,665. Coin Controlled Electrotherapeutic Machine. Winfield S. Bosley, Chicago, Ill., assignor to the Mills Novelty Company, same place. Filed July 2, 1900.

672,712. System of Electrodynamical Propulsion. Leon Rosenfeld, Constantin Ze'eny and Julien Dulait, Charleroi, Belgium. Filed Jan. 31, 1900.

672,715. Galvanic Battery. Charles B. Schoenmehl, Watervliet, Conn., assignor to the Watervliet Battery Company, same place. Filed Oct. 30, 1900.

672,727. Means for Protecting Commutators. Alfred de Veau Baldwin, New York City. Filed Feb. 14, 1901.

672,753. Spark Arrester. Larkin L. Crump, Westpoint, Miss. Filed July 17, 1900.

672,830. Railway Signal System. William W. Hoffman and Francis W. Powers, West Lafayette, Ind. Filed June 6, 1900.

672,841. Electric Mallet or Hammer. Charles D. Olsen, Denver, Col. Filed Jan. 18, 1900.

672,851. Electrical Transmission of Motion for Steering Ships or for Other Purposes. Harry A. Spiller, Boston, Mass., assignor, by mesne assignments, to the General Electric Company, Schenectady, N. Y. Filed Oct. 30, 1891.

672,875. Sparking Igniter for Explosive-Engines. Abraham Lath, New York City, assignor to the Safety Three-Wheel Vehicle Company, same place. Filed Feb. 17, 1900.

THE TELEPHONE WORLD.

Rural Telephones Have Covered Kansas.

A telephone directory of the independent exchanges and toll stations in Central Kansas has been issued, which reminds one of the fact that as late as 1895 there was not an independent company in Kansas and what few exchanges and toll stations there were at that time were operated by the Bell Telephone Company, and the prices were so exorbitant that a telephone was a luxury instead of the necessity as it is to day.

After the expiration of the Bell patents, companies were organized and exchanges were built, and to-day there are in Kansas over 300 large exchanges with from 150 to 600 subscribers each, besides almost every town and village east of Great Bend is connected with the outside world by telephone toll stations. These exchanges and toll stations are operated by about 150 different companies, capitalized at from \$5,000 to \$15,000 each, and the companies combined control over 5,000 miles of wire, and have thousands of subscribers.

The farm line systems this year will be one of the biggest parts of the telephone construction. These systems are built by the independent companies where a sufficient number of subscribers can be secured to warrant the building of the line, and before long the Kansas farmer will have telephones and can call up the nearest elevator to ascertain the price of wheat and other products of the farm without being compelled to haul his truck to town only to find a disappointed market for his stock.

In a very short time the Pennsylvania Railroad will have a long distance telephone line extending from Philadelphia to Pittsburg. Already the company has a line completed from Harrisburg to Altoona and there are stretches of wires between important points on the Pittsburg division. There is at present a line from Philadelphia to Columbia, and it is proposed to extend it to Harrisburg. Thus a line will be established between Philadelphia and Altoona. Then work will be started on joining the western lines to the eastern in order to complete the big loop. In time every part of the big system will be in communication by telephone with the central offices. The line on the middle division has proven a great convenience. There were those who did not approve of it when it was built less than two years ago, but every man along the line appreciates its advantages now.

The Southern New England Telephone Company, which recently purchased the local telephone system in Ansonia, Conn., will discontinue the local service of the old company on July 1. The subscribers who have only the instruments and service of the Ansonia Telephone Company can contract with the Southern New England Telephone Company for Southern New England Telephone service, such contract to begin July 1, 1901, and the Southern New England Telephone Company's instruments and service will be supplied to them in place of the Ansonia service from now until July 1, 1901. A modern switchboard equipped for 300 circuits, with a capacity of 1,000, has already been ordered at an expense of over \$3,000, and wires are to be put in conduits underground.

The Tyler, Tex., city council has granted a franchise to the Tyler Telephone Company to put in a system of telephones. S. F. Richardson, from San Antonio, will immediately begin the work of putting in the new line. This is the same company which has recently put in a system at San Antonio and Austin. The franchise stipulates that the new company cannot charge more than \$3 for business and \$2 for residence telephones.

A long legal battle is impending between the Wisconsin Telephone Company and the city of Kenosha. Acting City Attorney John C. Slater was ordered to prepare an ordinance compelling the telephone company to place all wires in the business district under ground. The ordinance it is thought will be passed at the next meeting of the city council. The telephone company has given notice that it will fight the claims made by the city and has refused to make any further concessions.

The Trempealeau & Buffalo County Telephone Company of Wisconsin has received its papers of incorporation. The officers of the company are C. H. Cooke, president; Ed. Jackson, secretary; Ole Pederson, treasurer, and A. J. Bauth, general manager. The line will run from Independence to Gilmanton. Work will commence shortly.

The Bell Telephone & Telegraph Company of Mobile, Ala., has asked and been granted permission to put its wires in a conduit in the business quarter of the city. This will greatly improve the appearance of the streets, reduce the fire risk, and improve the telephone service.

Telephone Line in Liberia, Africa.

News has been received at Washington, D. C., from Minister Smith, who reports from Monrovia, February 24, that T. J. R. Faulkner, a civil engineer from the United States, has placed that city in telephonic communication with White Plains, a settlement 25 miles up the St. Paul's River. This is the longest line in the country.

The Providence R. I. Telephone Company has begun making the improvements needed to give an adequate service between the Valley exchange and that city. With only four trunk lines between Riverpoint and Providence, the delays in securing connections with Providence subscribers, with whom the Valley telephone users do the bulk of their business, have been the cause of much and long-continued annoyance. Over 100 miles of new iron wire will be strung, and when completed the new lines will afford eight instead of four circuits as at present.

The directors of the Citizens' Telephone Company of Grand Rapids, Mich., have authorized the construction of additional copper circuit toll lines in the northern part of the State. The farmers in the vicinity of Hastings, Lowell, Rockford and Cedar Springs, will get an increased service of about 60 miles soon. The board has arranged for the purchase of considerable new equipment.

Arrangements are being made to build a telephone line from Donnellson to Courtright's Corner, Ia., six miles north, to connect with the Salem line, which runs from Salem to La. Crew. If this is done Donnellson will have direct communication with La. Crew, Mt. Hamill, Salem and all the farmers along the line.

The Home Telephone Company, of Oskaloosa, Ia., a corporation of business men of that city, has transferred its property to a corporation consisting of Senator H. H. Evans, of Aurora, Ill.; W. H. Dunsmore, of Oskaloosa; E. R. Conkling, of Joliet, Ill., and M. Slusser, of Downer's Grove, Ill. The new company has over \$5,000,000 invested in telephone properties in Ohio and Illinois.

After to day there is to be a reduction in the telephone rates about Gardner, Mass. The measured service will be done away with entirely. Those who have been using \$25 measured service will be given unlimited service at the same charge. A 10-party line will be established for \$18, with unlimited service. Two and three party lines will not receive any reduction.

From Syracuse, N. Y., comes the report that the Central New York Telephone & Telegraph Company has begun work upon the improvements of the local service of the company upon which \$70,000 will be spent. Over 100 men will be employed in subway construction and the extension of cable lines to all parts of the city. The work will occupy several weeks.

A. L. Lowrey and others have applied to the city council of Hillsboro, Tex., for a franchise for a local independent telephone exchange. It will be passed on by the council at its first meeting this month.

At a special meeting of the board of selectmen of Marblehead, Mass., a franchise was granted the New England Telephone & Telegraph company to set poles and string wires through certain streets and locate an exchange in that town.

There is a rumor that the Sumner and Paris, Mo., Telephone Company, will soon begin setting poles for a line across country from Sumner to South Paris.

The People's Telephone Company has been granted a franchise in Plainwell, Mich. Work on construction will begin at once.

The Colorado Telephone Company will expend \$600,000 in extending and improving its lines in Colorado and Wyoming.

The Forman, N. D., Telephone Company will build a branch line between Forman and Havara in July.

A rural telephone line is to be built by Pennsburg, Pa., capitalists.

The local telephone system in Monticello, Mich., is nearly completed.

It is said that the telephone line will be extended from Gold Hill to Crescent, Ore.

The newly incorporated Watkins, N. Y., Telephone Company was authorized to build, maintain and operate a first-class telephone system within the limits of that village at a regular meeting of the village trustees held recently. The ordinance authorizing the company to construct was unanimously adopted. There are several conditions upon which the franchise is granted, one of them being the maintenance of two instruments for the use of the village authorities, to be placed wherever the trustees shall direct. The company is to give a bond in the sum of \$3,000 to indemnify the village against damages that may result from the construction and maintenance of the system. The company at present consists of B. G. Hubbell, J. H. Fuller and C. B. Stone, all of Cleveland, O. Work must be begun within ninety days, or the franchise will be declared void. These directors are the same men who recently applied for the telephone franchise in Elmira, N. Y.

According to the New York "Commercial," the fate of the Erie telephone system, control of which is now held by the Old Colony Trust Syndicate of Boston, which interests are friendly to the Bell, is a matter of considerable speculation. It has been reported that the Telephone, Telegraph & Cable Company of America would attempt to regain the control lately surrendered. The officials of the independent company deny this. President Wilson of the Telephone, Telegraph & Cable Company says: "No official knowledge of the authorization of the purchase of the Erie Telephone Company to the Telephone, Telegraph & Cable Company of America exists." Erie stock has been steadily advancing in the market. The Telephone, Telegraph & Cable Company still holds 21,000 shares, and is by no means a small factor in the future of the Erie. Bell interests are suspected of an attempt to depress the stock, but if they sought to do this they have failed, hence the source of recent buying is more mysterious than ever.

An ordinance granting to James E. Bell, president of the Bell-Nelson Mill Company, his successors or assigns, the right, privilege and franchise to lay down, construct and maintain an underground telegraph and telephone system in Everett, Wash., was read for the first time at the last meeting of the city council. The life of the franchise is 50 years, and the ordinance stipulates that work shall begin on the proposed system within 90 days after the ordinance granting it shall have been passed, the construction to be under the supervision of the city engineer. The ordinance further stipulates that the prices charged for service shall be \$3 a month for a one party business line, \$2.50 a month for a two party business line, \$3 a month for a one-party residence line, and \$1.50 a month for a two-party residence line.

The Troy, N. Y., Telephone & Telegraph Company has lowered its rate to \$30 a year for a business place and private residence. This rate, which went into effect last week, is for a long-distance instrument, with metallic circuit. The equipment, the telephone people say, will be the best that can be procured. The new rate is the same that prevails in Albany. The company has given out an official statement in which it refers in subtle terms to the attitude of the city authorities on the question of underground wires.

Articles of incorporation of the Trans-Mississippi Telephone & Telegraph Company, with offices at Des Moines, Ia., and a capital of \$100,000, were signed last week. The officers are: President, J. W. Hill of Des Moines; vice-president, F. C. Hubbell of Des Moines; manager, A. T. Pearson of Iowa City; treasurer, M. McFarland of Des Moines. The object of the company is to furnish long-distance telephone trunk lines to connect the 200 independent telephone systems in Iowa. The first line will be constructed from Council Bluffs to Iowa City.

The affairs of the Manchester, N. H., Telephone Company, which were thought to be about ready for final settlement, are still unsettled and probably will be for some time to come. By order of Judge Wallace, in the Superior Court, the report of the commissioner appointed by the court to fix claims against the company's estate was re-committed to have additional facts found.

Private parties are building a telephone line from Tusculum to Russellville, Tenn., 20 miles south, which will give Nashville direct communication with Russellville in a few weeks.

The Cane Belt telephone line of Wharton, Tex., has been extended to the new pumping station, Garwood, which is the terminus of the spur lately built by that railroad.

The Western Union Telegraph Company plans to compete in Kansas City, Mo., with the telephone company.

GENERAL ELECTRICAL NEWS.

Lighting.

Adams, Minn.—H. E. Johnson will erect a new flour mill and electric light plant here.

Alma, Kan.—J. H. McMahan, owner of the telephone company, will install an electric light system here.

Chicopee, Mass.—Steps will soon be taken by Manager Stebbins of the electric light plant to get estimates and figures on the proposed improvements and addition to the plant.

Clifton, Tenn.—Mr. Mansfield of Bellbuckle will establish an electric light plant here.

Corning, N. Y.—The Corning Gas Company has sold its illuminating gas plant, and the Corning Light & Power Company, the city electric lighting plant, to a syndicate of Eastern capitalists, headed by Alden M. Young, of New York City. Both plants will be operated under the new management.

Decatur, Ill.—The Decatur Gas & Electric Company will begin at once to make extensive improvements in both gas and electric plants. About \$15,000 will be expended.

Gallatin, Tenn.—The Legislature has passed a bill authorizing the issuance of bonds for the construction of an electric light plant.

Gloster, Miss.—C. H. Jenks of St. Louis, Mo., will prepare preliminary plans for an electric light plant.

Grand Island, Neb.—The Grand Island Gas Company, of which H. G. Leavitt is president, has decided to erect an electric light plant here.

Greensburg, Pa.—A short time ago S. C. Knight, of Fort Wayne, Ind., was here making plans for the erection of an electrical plant to cost \$500,000. It is the intention of the company to light all of the town within a radius of 40 miles with electric lights.

Gridley, Ill.—The question of erecting an electric light plant is being agitated by the citizens of this place.

Helena, Mont.—An Eastern syndicate has completed arrangements to purchase the stocks and bonds of the local company owning the street car, electric light and gas plants here, at a price aggregating \$250,000.

Iuka, Miss.—The citizens have voted to issue \$10,000 in bonds to build an electric light plant.

Jamestown, N. D.—The Citizens' Electric Light & Power Company has been incorporated here with \$35,000 capital stock by D. B. Hannah, G. Lutz, O. L. Churchill, T. Pettigrew and others. The company contemplates the purchase of the Jamestown Electric Light Company's plant and will completely remodel and rebuild the same at an estimated cost of about \$15,000.

Jermyn, Pa.—The People's Electric Company of this city has been incorporated with \$5,000 capital stock.

Kendrick, Idaho.—C. T. Bowen, an Eastern capitalist, contemplates putting in an electric light plant here.

Lompoc, Cal.—This place is to have an electric light plant.

Lowell, Mich.—Lowell contemplates the expenditure of about \$5,000 in improvements to its electric light plant.

Merrimack, Wis.—The village board has voted to assist local capital in constructing an electric light plant. N. Farnsworth will be one of the leading stockholders.

Middleport, N. Y.—W. C. Johnson of Niagara Falls has been granted a franchise to operate an electric light plant in this place.

Mishawaka, Ind.—The Dodge Manufacturing Company is about to let a contract for the installation of an extensive electric lighting plant for that establishment.

Morrisville, N. Y.—William Earl has purchased the electric light plant here.

Philadelphia, Pa.—Plans and specifications have been received from Washington by Penrose A. Mc Clain, custodian of the postoffice, for the installation of a new electric plant. Bids must be filed before May 14. The work is to be completed by October.

Suffolk, Va.—Bids will be received until May 15 for the erection of an electric light plant. W. N. McAnge, chairman, can be addressed.

Red Lion, Pa.—The stockholders of the electric

light company are making arrangements to build a new electric light plant.

Rock Hill, S. C.—This city will hold an election to decide the issuance of \$95,000 of bonds for purchasing the electric light plant and waterworks of the Rock Hill Water, Light & Power Company.

Santa Fe, N. M.—About \$50,000 will be expended at once by the Water & Light Company. This sum will be used in extending the light wires, increasing the power of the plant, etc.

Sault Ste. Marie, Mich.—The Chandler-Dunbar Water Power Company and the Edison Sault Electric Company have made arrangements to enlarge their plant extensively, and the work will begin within two months.

Selma, Ala.—The electric light plant at this place was badly damaged by a recent storm.

Sydney, C. B.—A party of Boston capitalists has secured concessions from this town and Glace Bay, to furnish electric light and to operate electric tramways.

Woodbine, Ia.—Woodbine contemplates the issuance of \$10,000 in bonds to build an electric light plant.

York, Pa.—The Merchants' Electric, Light, Heat & Power Company has purchased a site for the erection of its proposed plant.

Street Railways.

Columbus, O.—The power plant of the Columbus, Buckeye Lake & Newark Traction Company will be established at Hebron near Buckeye Lake.

Dimondale, Mich.—The township board has granted a franchise through the village and township to the promoters of the Battle Creek & Lansing Electric Railway.

Evansville, Ind.—The Evansville Electric Railway Company has filed a notice with the Secretary of State of an increase of capital stock from \$50,000 to \$600,000.

Indianapolis, Ind.—O. P. Ensley, A. M. Glossbrenner, H. A. Mansfield and F. W. Roberts of this city are promoting an electric line as a part of the proposed system between here and Logansport.

Kokomo, Ind.—Business men of this place have organized an association for the purpose of promoting interurban electric lines to center here.

La Grange, Ind.—J. F. Shuman of Angola is one of the promoters and the secretary of the electric railway to be built from Angola to Goshen by way of Orland and this place.

Lorain, O.—The county commissioners have granted a 25 year franchise to the Sandusky & Interurban Electric Railway Company, to construct its line through Lorain County.

Louisville, Ky.—The Louisville & West Point Electric Railway Company has been incorporated for \$5,000 by W. J. Lewis, who is the president.

Middletown, Conn.—It is reported a trolley line will be built from this place to Meriden over the old Meriden and Cromwell road from Westfield, and over the Branch road to Westfield.

New Haven, Conn.—It was lately announced that the New York & New Haven Road would soon equip the Waterbury division of the New Haven system with electricity. The expense for machinery alone will be \$300,000.

Niagara Falls, N. Y.—The International Traction Company may extend its lines from here to Batavia.

Portland, Me.—Articles of association have been received by the railroad commissioners from the Portland & Brunswick Street Railway Company, which proposes to construct an electric road from the town of Brunswick through Freeport and Yarmouth, a distance of about 16 miles.

Pottstown, Pa.—The Reading, Birdsboro & Pottstown Electric Railway Company has been incorporated by R. J. Purcell, T. F. Durham and H. A. Deery.

Trenton, N. J.—Among the trolley line projects of the near future is a road from this city across the State to the upper coast seashore resorts. This is not a part of the Johnson scheme, but is said to be contemplated by the Camden & Trenton Railway Company.

Manufacturing.

Baltimore, Md.—The Patapsco Electric Manufacturing Company has been formed with a capital of \$100,000.

Chicago.—The B. & H. Storage Battery Company, with a capital of \$2,500, has been formed for the purpose of manufacturing storage batteries, etc. Fred W. Kraft, H. W. Paddock and L. Miller are the promoters.—The Reynolds Electric Company, capitalized at \$2,500, has been organized for the purpose of manufacturing electrical machinery, devices and supplies. Henry W. Prouty, Peter Anderson and Alvin L. McElroy are back of the enterprise.

New York City.—The Standard Meter Company has been formed to manufacture water meters and motors, with a capital of \$100,000. W. H. Marsh, J. S. Simmons and J. A. Young are interested in the enterprise.

Company Matters.

Chicago.—The Automatic Electrical Repair Company's Works was slightly damaged by a recent fire.

El Paso, Tex.—The International Light & Power Company filed an amendment to its charter increasing its capital stock from \$25,000 to \$50,000.

Hoosick Falls, N. Y.—The Hoosick Falls Electric Company has been sold to Worcester, Mass., parties. At a recent meeting of the new company the following officers were elected: President, L. A. Taylor; treasurer, William H. Hylee; secretary and assistant treasurer, Frank H. Viele, all of Worcester.

Martinsburg, W. Va.—Messrs. Shade and Hammond, have formed a partnership for the purpose of dealing in electric fixtures, doing wiring and any other work of a general electric kind.

New Haven, Conn.—The Brown Electrical Construction Company, of which C. Fred Brown is agent, filed a petition in bankruptcy at the office of Referee Newton last week. The schedules accompanying the petition show liabilities amounting to \$10,896.62, and assets of \$646.

Power and Transmission.

Cannon Ferry, Mont.—The Missouri River Power Company, that owns a dam and power plant here and is now constructing a pole line to Butte, will build another dam across the Missouri River at Stubbs Ferry, five miles below the present plant. The new dam and plant will cost \$1,000,000, and will develop 10,000 horse power, which, with part of the power now generated here, will be sent to Butte.

Mines.

Lake City, Col.—The Hidden Treasure Mine property is worked by water power through electricity and air. But the intention of the company is to do away with air altogether and substitute electricity. This power will be applied to drills in the tunnel first and if successful electric drills will be used all over the mine.

Automobiles.

Davenport, Ia.—The first electric automobile made its appearance on the streets of this city recently.

Kansas City, Mo.—The Day Automobile Company held its opening reception at its new quarters a short time ago.

Kingston, N. Y.—I. M. Block, J. W. Brewster of this place, and William F. Rafferty of Rondout, are the directors of the newly formed Kingston Automobile Fire Alarm Company, capitalized at \$30,000.

New York City.—The Adams-McMurtry Company, capitalized at \$10,000, has lately been organized to deal in automobiles. Messrs. George B. Adams, A. L. McMurtry and H. W. Pratt, all of this city, are the interested parties.

Philadelphia, Pa.—Plans for an electric vehicle line on Broad street are being prepared by Samuel A. Boyle, Jr., attorney, and the local president of the company using the Gilday motor vehicles.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debenture; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Authoriz'd	Issued.				
Albany, N. Y. - Apr 29					
United Traction Co. (Consolidation of the Albany and Troy City Railway.)	100	\$5,000,000	\$5,000,000	108 1/2	109 3/4
Allentown Pa. - Apr 29					
Allentown & Lehigh Val. Trac. Co.		4,000,000	1,500,000		15
Bridgeport, Conn. - Apr 29					
Bridgeport Traction Co.	100	2,000,000	2,000,000	100	
Baltimore Md. - Apr 29					
United Railways & Elec. Co. com.	50	24,000,000	13,000,000	17 1/2	17 3/4
Boston, Mass. - Apr 29					
New England Street Ry.	25	5,000,000	1,081,922	1 1/2	1 1/2
North Shore Traction Co. com.	100	4,000,000	4,000,000	85	87
North Shore Traction Co. pfd.	100	2,000,000	2,000,000	98	98 1/2
West End Street Ry. Co. com.	50	10,000,000	1,000,000	114	115
West End Street Ry. Co. s. pfd.	50	1,000,000	6,400,000	177	178
Boston Elevated R. R.	100	10,000,000			
Brooklyn N. Y. - Apr 29					
Brooklyn City Ry.	100	2,000,000	1,928,400	235	240
Brooklyn Rap. Transit Co., tr. cert.	100	43,000,000	43,000,000	8 1/2	8 7/8
Brooklyn Heights Railroad.	100	200,000	200,000	101	109
Brooklyn City RR. guar.	100	12,000,000	12,000,000	287	289
Brooklyn Queens Co. & Sub. RR.	100	2,000,000	2,000,000		
Coney Island & Brooklyn RR.	100	2,000,000	1,884,200	325	332
Kings County Elevated.	100	4,750,000	4,750,000		
Kings County Traction Co.	100	4,500,000	4,500,000		
Nassau Electric Railroad. pfd.	50	6,000,000	6,000,000	75	80
Atlantic Avenue Railroad.	50	2,000,000	2,000,000		
Brooklyn, B. & W. E. Railroad.		1,000,000	1,000,000		
Buffalo N. Y. - Apr 29					
Buffalo & Niagara Falls Elec. Ry.	100	1,250,000	1,250,000	74	75
Buffalo Railway Co.	100	6,000,000	5,870,500	99	100
Columbus O. - Apr 29					
Columbus Street Railroad.	100	8,000,000	8,000,000	88	88 1/2
Columbus Street Railroad, pfd.	100	1,500,000	1,500,000	92	93
Charleston, S. C. - Apr 29					
Charleston City Ry. Co.	50	100,000	100,000		
Enterprise City RR. Co.	25	1,000,000	250,000		
Chicago, Ill. - Apr 29					
Chicago City Ry. Co.	100	12,000,000	12,000,000	210	261
Chicago & South Side R. T. RR.	100	10,823,800	10,823,800	14	14 1/2
Lake Street Elevated RR.	100	10,000,000	10,000,000	8 1/2	8 3/4
Metropolitan West Side Elev. Ry.	100	15,000,000	7,000,000	17	17 1/2
Met. West Side El., pfd.	100	15,000,000	9,000,000	209	210
North Chicago Street RR.	100	10,000,000	6,600,000	197	200
North Chicago City RR.	100	500,000	249,900	59 1/2	60
South Chicago City Railway.	100	2,000,000	1,608,200	105 1/2	106
West Chicago St. RR. Co.	100	20,000,000	18,189,000	14	14 1/2
Union Traction Ry. com.	100	1,250,000	624,900	56	57
Union Traction Co. pref.	100	2,000,000	2,000,000		
Cincinnati, Ohio. - Apr 29					
Cincinnati Inc. Plane Ry. com.	50	1,000,000	575,000		
Cincinnati Inc. Plane Ry. pfd.	50	150,000	150,000		
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,000,000	124 1/2	125
Cincinnati Street Ry. Co.	50	18,000,000	14,000,000	126 1/2	127
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000		
Cleveland, Ohio. - Apr 29					
Akron, Bed. & Elev. Elec. Ry.	100	1,000,000	1,000,000	48	50
Cleveland City Ry.	100	8,000,000	7,600,000	102	102 1/2
Cleveland Electric Ry.	100	12,000,000	12,000,000	83	84 1/2
Detroit, Mich. - Apr 29					
Detroit Citizens' Street Ry.	100	2,000,000	1,250,000	100 1/2	
St. Wayne & Belle Isle Ry.	100		1,200,000	175	
Rapid Railway Co.	100		250,000	90	100
Detroit Electric Railway.		1,000,000	1,000,000		
Wyandotte & Detroit River Ry.	100	250,000	200,000	100	110
Dayton O. - Apr 29					
City Railway Co. com.	100	1,500,000	1,470,600	140	145
City Railway Co. pfd.	100	600,000	600,000	170	
People's Street Railway.		1,100,000	1,100,000	114	115

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Authoriz'd	Issued.				
Hartford Conn. - Apr 29					
Hartford Street Ry. Co.	100	34,000,000	\$200,000	150	
Hartford & West Hartford Ry.	100	1,000,000	247,000		
Holyoke Mass. - Apr 29					
Holyoke Street Ry. Co.	100	400,000	400,000	207 1/2	212
Hudson N. J. - Apr 29					
North Hudson Co. (N. J.) Ry. Co.	25	1,250,000	1,000,000	150	
Indianapolis, Ind. - Apr 29					
Indianapolis Street Ry.		5,000,000	5,000,000	25	25 1/2
Lancaster, Pa. - Apr 29					
Pennsylvania Traction Co.	100	10,000,000	9,900,000		
Lancaster & Col. Electric Ry.			87,500		
West End Street Railway.					
Louisville, Ky. - Apr 29					
Louisville Ry. com.	100	4,000,000	8,500,000	12	12 1/2
Louisville Ry. pfd.	100	2,500,000	2,500,000	118	
Minneapolis, Minn. - Apr 29					
Twin City Rapid Transit Co. m.	100	17,000,000	15,010,000	68 1/2	68 3/4
Twin City Rapid Transit Co. pfd.		8,000,000	1,712,200	186	187
Montreal, Canada. - Apr 29					
Montreal Street Ry. Co.	50	4,000,000	4,000,000	268 1/2	265
Toronto Street Ry. Co.	100	6,000,000	6,000,000	108 1/2	109 1/2
Memphis Tenn. - Apr 29					
Memphis Street Railway Co.	100	500,000	500,000	3 1/2	
New Haven, Conn. - Apr 29					
Fair Haven & Westville RR.	25	2,000,000	2,000,000	39	41
New Haven Street Railway Co.	100	1,250,000	1,000,000		
New Haven & Centerville.	100	700,000	800,000		
Winchester Avenue RR.	25	1,000,000	600,000	45	46
New Orleans, La. - Apr 29					
Canal & Claiborne RR. Co.	40	240,000	240,000	148 1/2	158
New Orleans & Carrollton RR.	100	1,200,000	1,200,000	22 1/2	24
New Orleans Traction Co. new com.	100			95	98
New Orleans Traction Co. new pfd.	100	2,000,000	2,000,000	20 1/2	26
Crescent City RR. guar.	100	2,000,000	2,000,000		
New Or. City & Lake RR. guar.	100	2,000,000	2,000,000		
Orleans Railroad.	50	500,000	185,000	52	
St. Charles Street Railway.	50	1,000,000	1,000,000	56 1/2	57
New York - Apr 29					
Central Crostown RR.	100	500,000	603,000	185	200
Christopher & 10th Sts. RR. guar.	100	650,000	650,000	175	185
Dry Dock, E. Broadway & Battery RR.	100	1,200,000	1,200,000	120	125
Metropolitan Street Ry. Co.	100	45,000,000	45,000,000	174	184 1/2
Bleecker St. & Fulton St. Ry. guar.	100	900,000	900,000	85	87
Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000	286	240
Gen. Park N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	205	210
Eleventh Avenue RR.	100	1,000,000	1,000,000	390	405
42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	392	402
Ninth Avenue RR.	100	800,000	800,000	198	201
Sixth Avenue RR.	100	2,000,000	2,000,000	204	205
Twenty-third St. R. R. Co. guar.	100	600,000	600,000	400	410
Second Avenue RR.	100	2,500,000	1,862,000	2 1/2	212
Third Avenue RR.	100	12,000,000	10,000,000	155	155 1/2
42d St. Manhattan & St. Nich. Av.	100	2,500,000	2,500,000	65	76
Union (Huckleberry) Ry.	100	2,000,000	2,000,000	190	200
Newark N. J. - Apr 29					
Consolidated Traction Co. of N. J.	100	15,000,000	15,000,000	68 1/2	69
North Jersey Railway Co.	100	6,000,000	6,000,000	24	24 1/2
United Elec. Co. of New Jersey.	100	504,000	504,000	25 1/2	26 1/2
Pittsburg, Pa. - Apr 29					
Allegheny Traction Co.	50	500,000	100,000	27	28
Consolidated Traction Co. com.	50	15,000,000	15,000,000	21 1/2	22
Consolidated Traction Co. pfd.	50	9,478,850		67 1/2	68
Central Traction Co.	50	1,500,000		75 1/2	76 1/2
Citizens' Traction Co.	50	8,000,000		72 1/2	73 1/2
Duquesne Traction Co.	50	8,000,000			
Pittsburg Traction Co.	50	2,500,000			
Federal St. & Pleasant Valley Ry.	25	1,400,000			
Pgh., Allegheny & Man. Trac. Co.	50	8,000,000		27	29
Pittsburg & Birmingham Trac. Ry.	25	1,500,000			
Pittsburg & West End Ry.	50	8,000,000		41	42 1/2
United Traction Co. com.	50	17,000,000		5	15 1/2
United Traction Co. pref.	50	8,000,000		5 1/2	12

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.
b Leased to Boston Elevated Railroad Company.
c Owned by Brooklyn Rapid Transit Company.
d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
g Owned by Atlantic Ave. RR. and leased to Nassau system.
h \$80 per share on outstanding capital paid as rental by lessee - West Chicago St. RR. Co.; \$200.00 of stock owned by North Chicago Street Railroad Company.
i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
j \$8 1/2 per annum paid on outstanding capital as rental by lessee - North Chicago Street Railroad Company; \$425,100 of stock owned by West Chicago Street Railroad Company.
k Majority of stock owned by Chicago West Division Railway Company; 5% on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex div.

a Leased to New Orleans Traction Company at 6% on stock.
b Leased to New Orleans Traction Company at 8% on stock.
c Leased to Central Crostown Railroad at 8% on stock and interest on bonds.
d Operating the former Met. Trac. system, this corporation having become extinct.
e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
f Leased to Houston, West Street & Pavyon Ferry - now Metropolitan Street Railway.
g Leased to Metropolitan Street Ry. at 8% on stock until Oct. 1, 1897; thereafter at 9%.
h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1895, at \$215,000 per annum.
i Leased to Metropolitan Street Railway for 18% on stock.
j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6% first 8 years; 8% thereafter.
k Leased to Metropolitan Street Railway for \$145,000 per annum.
l Leased to Metropolitan Street Railway for 18% on capital stock.
m Controlled by Third Avenue Railroad by purchase.
n Dividends of 1% yearly guaranteed by Consolidated Traction Company.
o Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pith Traction Co.
p Leased to Consolidated Traction Company for 8% per annum on par value of stock.
q Leased to Fort Pitt Traction Company for 5% on \$8,000,000 capital stock.
r Leased to Consolidated Traction Company for 4% on capital stock.
s Leased to Consolidated Traction Company for 7% on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Capital Stock.			Rate and Date of Last Div.	Eld.	Asked.	NAME.	Capital Stock.			Rate and Date of Last Div.	Eld.	Asked.
	Par	Authorized	Issued.					Par	Authorized	Issued.			
New Bedford Mass. —Apr 29 Railway Co.....	100	\$250,000	\$250,000	4% Feb.	160	165	Boston, Mass. —Apr 29 American Tel. & Tel. Co.....	100	50,000,000	28,550,000	4% Q. Jan.	176	176 1/2
Northampton, Mass. —Apr 29 Street Ry.....	10	\$30,000	\$28,000	4% A. June.	170	178	Erie Telegraph & Telephone Co.....	100	10,000,000	10,000,000	1% Q. Feb. 20.	60	60 1/2
Omaha, Neb. —Apr 29 Street Ry.....	10	5,000,000	5,000,000	3% A. and N.	55	55	New England Telephone Co.....	100	10,894,800	10,894,800	\$1.50 p. sh. Feb.	189	189
Paterson, N. J. —Apr 29 Ry. Co.....	100	1,500,000	1,250,000	—	54	—	New York. —Apr 29 American Telegraph & Cable Co.....	100	14,000,000	14,000,000	1% Q. Q.	91	94
Providence, R. I. —Apr 29 : United Traction & Electric Co.....	10	8,000,000	8,000,000	3% Oct.	110	111	Central & South Am. Tel. Co.....	100	6,500,000	6,500,000	1% Q. Q.	100	106
Philadelphia. —Apr 29 Fairmount Park Trans. Co.....	50	2,000,000	1,770,000	2% Dec.	28	24	Commercial Cable Co.....	100	10,000,000	10,000,000	1% Q. Q.	178	175
Hestonville, Man. & Fairmount.....	50	1,966,100	1,966,100	2% July 15.	47	48	Franklin Tel. Co.....	100	1,000,000	1,000,000	1% Q. Q.	42	50
Hestonville, Man. & Fairmount.....	50	588,900	588,900	2% S. July.	70	76	Erie Telegraph & Telephone Co.....	100	5,000,000	4,800,000	1% Q. Feb.	116	118
Fairmount Pk. & Had. Pass. Ry.....	50	800,000	800,000	3% Feb. 1.	21 1/2	28	Gold & Stock Tel. Co. guar. 6%.	100	5,000,000	—	1% Q. Q.	116	118
Union Traction Co.....	50	80,000,000	29,980,450	3% Feb. 1.	81	31 1/2	International Ocean Tel. Co. guar. 6%.	100	8,000,000	—	1% Q. Q.	116	118
Electric Traction Co.....	50	500,000	112,500	3% share Q.	845	—	Mexican Telephone Co.....	100	2,000,000	—	1% Q. Q.	87	87 1/2
Citizens' Passenger Ry.....	50	1,000,000	1,875,000	\$1 share A—Apr 29	451	—	New York & New Jersey Tel. Co.....	100	5,000,000	8,723,000	2% Q. Jan.	175	180
Frankford & Southwark Pass. R.	50	1,000,000	—	—	48	—	Pacific & Atlantic Tel. guar. 4%	25	2,000,000	—	2% S.	70	75
Lehigh Avenue Ry. Co.....	25	1,000,000	—	—	90	90 1/2	Postal Telegraph Cable Co.....	100	15,000,000	15,000,000	1% Q. Q.	95	100
Lombard & South Street Ry.....	50	1,000,000	771,076	3% share A, Mar. '98	80 1/2	—	South & Atlantic Tel. Co. guar. 5%	25	950,000	559,525	2% S. Jan., '99.	115	—
Second & Third Streets Ry.....	50	10,000,000	16,000,000	3% A, April, '98.	150	151	Commercial Union Telegraph Co.....	25	500,000	500,000	2% S. Jan., '99.	98	98 1/2
People's Traction Co.....	50	1,500,000	572,800	3% Jan. 1898.	151	152	Western Union Telegraph Co.....	—	—	97,870,000	1% Q. Jan. '99.	—	—
Germanstown Passenger Ry.....	50	500,000	150,000	—	—	—	Div. guar. by Postal Tel. Co.	—	—	—	—	—	—
Green & Oates Passenger Ry.....	25	1,500,000	740,000	—	—	—	Miscellaneous. —Apr 29 : American Dist. Tel. (Phila.).....	25	400,000	—	1% Q. Q.	26	87
People's Passenger Ry.....	50	750,000	127,402	—	—	—	Bell Tel. Co. (of Canada).....	100	2,950,000	2,564,000	2% S.	188	—
Philadelphia Traction Co.....	50	30,000,000	120,000,000	2% p. sh., Oct. '98.	97	97 1/2	Chesapeake & Potomac Tel. Co.....	100	—	—	—	67	70
Catherine & Bainbridge St.....	50	1,000,000	400,000	6% A—Mar. '98.	138	157	Chicago Telephone Co.....	100	750,000	750,000	—	200	210
Continental Pass. Ry. guar.....	50	1,000,000	600,000	6% share—July, '98.	100	208 1/2	Central Dist. Frig. & Tel. Co. (Phg.)	100	—	—	—	148	160
Empire Passenger Ry. Co.....	50	1,000,000	475,000	\$7.50 share July '98	408	—	Empire & Bay States Telephone Co.	109	2,000,000	2,000,000	1% Q. Q.	75	76
Philadelphia City Pass. Ry.....	50	1,000,000	298,650	\$8.50 share July '98	100	—	Hudson River Telephone Co.....	50	2,500,000	2,500,000	2% Q. Q.	120	125
Philadelphia & Gray's Fy. RR.....	50	1,000,000	420,000	\$12 share, July '98.	8 3/4	509	Northwestern Telephone Co. guar.	50	—	—	—	122	125
Ridge Avenue Passenger Ry.....	50	750,000	200,000	\$2 share July, '98.	—	—	Providence (R. I.) Tel. Co.....	50	—	—	—	56	99
Philadelphia & Dart. Ry. guar.....	50	—	200,000	\$2 share July, '98.	—	—	Southern New Eng. Tel. Co.....	100	8,000,000	—	—	—	—
15th & 19th Sts. Pass. Ry. guar.....	50	1,000,000	885,000	\$11 sh. A, July, '98	240	—	ELECTRIC LIGHT AND ELECTRICAL MFG. COS. Boston, Mass. —Apr 29	—	—	—	—	—	—
Thirteenth & 15th Sts. Pass. Ry.....	50	1,500,000	900,000	\$9.50 share, July '98	268	—	Fort Wayne Electric trust receipts..	25	—	—	—	115	125
Union Passenger Ry. Co.....	50	750,000	750,000	\$10 share, July '98	62	268	Fort Wayne Elec. Co. T. Sec. Series A.	25	—	—	—	15	25
West Philadelphia Pass. Ry.....	50	—	—	—	—	—	General Electric Co. [old] com.	100	40,000,000	30,460,000	2% Q. Aug., 1898.	228	228 1/2
Rochester, N. Y. —Apr 29 Rochester Railway Co.....	100	5,000,000	5,000,000	—	20	23	General Electric Co. [new] com.	100	18,276,000	18,276,000	1% Q. Apr., 1901.	228	228 1/2
Reading, Pa. —Apr 29 Reading Traction Co.....	—	1,000,000	1,000,000	semi-ann. Jan. & July	24	26	P. H. Elec. Co. T. Sec. Series C.	50	—	146,700	—	65	65 1/2
City Passenger Ry.....	50	850,000	850,000	Jan., '98	138	—	Westinghouse Elec. & Mfg. Co. com.	50	4,000,000	3,996,058	1% Q. Jan.,	74 1/2	75
East Reading Electric Ry.....	50	1,000,000	11,000,000	—	70	—	Westinghouse El. & Mfg. Co. rights.	50	11,000,000	8,195,126	—	134	134
St. Louis Mo. —Apr 29 South Street & Arsenal Ry.....	50	800,000	150,000	—	—	—	New York. —Apr 29	—	—	—	—	—	—
Jefferson Avenue Ry. Co.....	50	400,000	400,000	2% Dec., 1898.	—	—	Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	—	119	120
Lindell Ry.....	100	2,500,000	2,400,000	1% Jan. '99.	—	—	Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1% Q. Oct., '98.	8	12
National Railway Co.....	—	2,500,000	2,479,000	1% Jan. '99.	—	—	Edison Ore. Milling Co.....	100	—	—	—	—	—
Cass Avenue & Fair Grounds.....	—	2,500,000	2,500,000	—	—	—	Electric Vehicle Co.....	100	—	—	—	—	—
Citizens' RR.....	100	2,000,000	1,500,000	4% Oct., '98.	—	—	General Electric Co. [old] com.	100	40,000,000	30,460,000	2% Q. Aug., 1898.	227	227 1/2
St. Louis RR.....	100	2,000,000	2,000,000	2% Jan., '99.	—	—	General Electric Co. [new] com.	100	18,276,000	18,276,000	1% Q. Apr., 1901.	227	227 1/2
Missouri RR.....	50	2,400,000	2,800,000	1% Jan., '99.	—	—	Interior Conduit & Insulation Co...	100	1,000,000	1,000,000	—	41	—
People's RR Co.....	50	1,000,000	800,000	40c, Dec., '89.	24	24 1/2	Kings Co. El. L. & P. Co.....	100	2,500,000	2,500,000	A. & O.	110	125
United Electric Ry.....	50	500,000	500,000	—	79	80	Pittsburg, Pa. —Apr 29	—	—	—	—	—	—
United Electric Ry..... 5% pref.	100	1,000,000	1,000,000	3% Jan., '99.	68	65	Allegheny County Light Co.....	100	500,000	500,000	J. & J.	168	172
St. Louis & Suburban Ry.....	100	3,000,000	2,500,000	3% A. July, '99	94	93	East End Electric Light Co.....	50	800,000	800,000	Q	—	—
Union Depot RR.....	100	4,000,000	4,000,000	3% A. July, '99	—	—	Philadelphia, Pa. —Apr 29	—	—	—	—	—	—
San Francisco, Cal. —Apr California St. Cable RR.....	100	1,000,000	500,000	40c. monthly.	117	119	Edison Electric Light Co.....	100	2,000,000	—	—	144	144 1/2
Market Street Park & Ocean RR.....	100	1,000,000	875,000	\$2.50 share, '98.	50	—	Electric Storage Battery Co. com.	100	8,500,000	—	—	65	65
Market Street Ry.....	100	18,750,000	18,750,000	Q., 60c. per share.	61 1/2	68 1/2	Electric Storage Battery Co. pfd.	100	5,000,000	—	—	63	67
Presidio & Ferries RR.....	100	1,000,000	550,000	—	16	—	Northern Elec. Light & Power Co...	10	550,000	550,000	—	18	18 1/2
Scranton Pa. —Apr 29 Scranton Railway Co.....	50	6,000,000	2,500,000	—	29	30	Southern Elec. Light & Power Co...	10	187,500	187,500	—	80	—
Scranton & Carbondale Trac. Co...	100	500,000	500,000	—	16 1/2	—	Miscellaneous. —Apr 29	—	—	—	—	—	—
Scranton & Pittston Traction Co...	100	1,050,000	1,050,000	—	—	—	Bridgeport (Conn.) Elec. Lt. Co...	25	500,000	—	—	47	48
Springfield Ill. —Apr 29 : Springfield Consolidated Ry.....	100	750,000	750,000	—	—	—	Missouri-Edison (St. Louis) com.	—	—	—	—	20	21
Springfield O. —Apr 29 Springfield Street Ry.....	100	1,000,000	1,000,000	—	—	—	Eddy Electric Mfg. Co.....	25	—	—	—	9	14
Springfield, Mass. —Apr 29 Springfield Street Ry.....	100	1,300,000	1,166,700	3% A	207	212	Eastford (Conn.) Elec. Light Co...	100	850,000	—	—	175	176
Toronto Canada. —Apr 26 Toronto Street Ry.....	100	6,000,000	6,000,000	1% Q. S.	106 3/4	107 1/2	Hartford (Conn.) Lt. & Power Co...	25	175,000	—	—	6	10
Montreal Street Railway Co.....	100	4,000,000	4,000,000	1% S.	272 1/2	265	New Haven (Conn.) Elec. Lt. Co...	100	100,000	—	—	195	—
Washington, D. C. —Apr 29 : Belt Ry. Co.....	50	500,000	500,000	—	—	—	Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	—	2% Q. Oct.,	103	101
Capital Traction Co.....	100	12,000,000	12,000,000	55c. per sh. Oct.	102 1/2	102 1/2	Rhode Island Elec. Protec. Co.....	100	—	—	—	115 1/2	120 1/2
Columbia Ry. Co.....	50	400,000	400,000	6% A.	85	40	Royal Elec. Co. (Montreal).....	—	1,320,000	—	1% Q	121 1/2	128 1/2
McKington & Soldiers' Home Ry.....	50	707,000	652,000	—	20	21	Toronto (Canada) Elec. Light Co...	100	1,085,000	1,085,000	1% Q	183	185 1/2
Georgetown & Tenallytown Ry.....	50	303,000	300,000	—	—	—	Thomson-Houston Welding Co.....	100	—	—	8% S. Dec. 1.	108	108
Metropolitan RR. Co.....	50	1,000,000	452,900	3% Q	—	—	Woonsocket (R. I.) Electric Co.....	100	—	—	—	108	108
Worcester, Mass. —Apr 29 Worcester Traction Co.....	100	8,000,000	8,000,000	—	82 1/2	35	ALLIED INDUSTRIES. Boston Mass. —Apr 29	—	—	—	—	—	—
Worcester & Suburban Street Ry...	100	2,000,000	2,000,000	3% S. Feb.,	107	108	American Electric Heating Co.....	50	10,000,000	—	—	—	—
Wilkesbarre, Pa. —Apr 29 Wilkesbarre & Wyoming Val Trac..	100	5,000,000	5,000,000	4% Q. 1899	—	85	Street Ry. & Ill'g Properties... pfd	100	4,500,000	1,248,700	\$2 p. sh.	—	100
				1% Jan.,	25	29	United Electric Securities Co... pfd.	100	—	1,000,000	\$8.50 p. sh.	—	—

* Unlisted. † Paid in. ‡ Full paid. § Outstanding. ¶ Ex-div.
a Leased to Hestonville, Man. & Fairmount Passenger Ry. for 6% on stock per annum.
b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
c Practically all shares owned by Union Traction Company.
d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
e Leased to Electric Traction Company.
f Controlled by Frankford & Southwark Passenger Railway.
g Leased to People's Passenger Railway at \$5 per share.
h Majority of stock owned by People's Traction Company.
i Leased to Union Traction Company.
j Lease transferred to Union Traction Company.
k Leased to Union Traction Company at a rental of \$10,000 per annum in 1896-7-8-9. \$20,000 in 1899-1900 and \$30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.
l Dividend of 10% guaranteed by Reading Traction Company.
m Dividend of 6% guaranteed by Reading Traction Company.
n Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

† On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to \$20,827,200, of which \$18,276,000 is common and \$2,551,200 preferred.
‡ Ex div.
§ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent company, the Municipal Electric Light Co.

ALLIED INDUSTRIES.

Boston Mass. - Apr 29						
American Electric Heating Co.....	50	10,000,000				
Street Ry. & Ill'g Properties... pfd	100	4,500,000	1,248,700	\$2 p. sh.		
United Electric Securities Co... pfd.	100	-----	1,000,000	\$8.50 p.sh.		100
New York. - Apr 29						
Consolidated Electric Storage Co...	...	-----	-----	-----	8	12
Safety Car Heating & Lighting Co...	100	-----	-----	-----	150	155
Worthington Pump Co.....com.	100	5,500,000	5,500,000	-----	---	---
Worthington Pump Co.....pfd	100	2,000,000	2,000,000	1 X A	118	174
Philadelphia Pa. - Apr 29						
Electro Pneumatic Trans. Co.....	10	1,500,000	-----	-----	1%	1%
United Gas Improvement Co...scrip.	50	10,000,000	-----	-----	---	162
Welsbach Commercial Co.....com.	100	8,500,000	-----	-----	20%	21%
Welsbach Commercial Co.....pfd.	100	500,000	-----	2 X Q	73	75
Welsbach Light Co.....	5	525,100	-----	-----	51	51
Welsbach Light Co., Canada.....	5	500,000	-----	-----	1	1%
Pittsburg, Pa. - Apr 29						
Carborundum Mfg. Co.....	100	200,000	200,000	-----	217	218
Standard Underground Cable Co...	100	1,000,000	1,000,000	Q		
Miscellaneous. - Apr 29						
*Barney & Smith Car Co.....com.	100	-----	1,000,000	-----	21	25%
*Barney & Smith Car Co.....pfd.	100	-----	100,000	1 X	180	181
Billings & Spencer Co.....	25	-----	-----	-----	82	82
C. Noel. Car Heating Co.....	100	1,250,000	1,250,000	1% % Feb	62	60
Johns-Pratt Co.....	100	-----	-----	-----	105	109
*Pratt & Whitney Co.....com.	100	-----	-----	-----	---	---
*Pratt & Whitney Co.....pfd	100	-----	-----	-----	85	90
Stillwell-Bierce Co.....com.	---	-----	-----	-----	---	---
Stillwell-Bierce Co.....pfd.	---	-----	-----	-----	50	50
Shultz Belting Co.....	---	500,000	-----	2 X Sept 1 '99.	80	80
St. Charles Car Co.....	---	-----	-----	-----	89	8
Unlisted.						

BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

Albany N. Y.							New Orleans La.									
Date of Quotation—Apr 29, 1901							Date of Quotation—Apr 29, 1901									
NAME.	Amount.	Authorized.	Issued.	Due.	Interest periods.	Bid.	Asked.	NAME.	Amount.	Authorized.	Issued.	Due.	Interest periods.	Bid.	Asked.	
The Albany Ry. Co. Cons. mtg. 5s	\$500,000	427,500	1940	J. & J.	117½	118		Canal & Claiborne RR. cons mtg. 5s	\$150,000	150,000	1912	M. & N	.....	.....	.....	
The Albany Ry. Co. Gen. mtg. 5s	750,000	875,000	1947	M. & N.	118½	.....		Oreosent City RR. 1st mtg. 5s	.....	80,000	1899	M. & N	105½	.....	.....	
Watervliet Turnpike & RR. 1st mtg. 5s	850,000	850,000	1919	M. & N.	112½	.....		Oreosent City RR. Cons. mtg. 5s	5,000,000	8,000,000	1943	J. & J.	.....	.....	.....	
Watervliet Turnpike & RR. 2d mtg. 5s	150,000	160,000	1919	M. & N.	112½	127		New Orleans City RR. 1st mtg. 5s	416,500	899,000	1908	J. & D.	108	112	118	
Troy City Railway Co. 1st mtg. 5s	.....	.....	1942	.....	116½	118		N. Or. City & Lake RR. 1st mtg. 5s	5,000,000	2,599,500	1949	J. & J.	112	.....	.....	
Interest guar. by Albany Ry. Co. Principal and interest guar. by Albany Ry. Co.								N. Orleans & Carrollton RR. 2d mtg. 5s	850,000	850,000	1907	F. & A.	.....	.....	.....	
								Orleans Railroad Co. Cons. mtg. 5s	800,000	800,000	1912	J. & J.				
								St. Charles St. RR. Co. 1st mtg. 5s	800,000	75,000	1907	J. & D.				
								1842,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds. 1990,000 outstanding.								
Baltimore Md.							New York.									
Date of Quotation—Apr 29, 1901							Date of Quotation—Apr 29, 1901									
United Electric Ry. Co. 1st mtg. g. 4s	88,000,000	8,000,000	1949	M. & S.	102	102½		Atlantic Ave. (Brooklyn) Imp. g. 5s	1,500,000	1,500,000	1984	J. & J.	95	.....	.....	
.....income 4s.	14,000,000	.....	1949	J. & D.	74½	75		Atlantic Av. (Brooklyn) 1st gen. mtg. 5s	759,000	759,000	1906	M. & S.	107½	110	.....	
Baltimore City Pass. Ry. 1st mtg. g. 5s	2,000,000	2,000,000	1911	M. & N.	118½	.....		Atlantic Av. (Brooklyn) Cons. mtg. 5s	8,000,000	1,965,000	1981	A. & O.	115	116	.....	
Baltimore Traction Co. 1st mtg. 5s	1,800,000	1,500,000	1929	M. & N.	119	120		Brooklyn & 7th Ave. 1st cons. mtg. 5s	12,500,000	7,650,000	1948	J. & D.	128	128	.....	
Baltimore Trac. Co. Exten. & Imp. g. 5s	1,250,000	1,250,000	1901	M. & S.	104½	.....		Brooklyn & 7th Ave. 2d mtg. 5s	1,500,000	1,500,000	1904	J. & D.	104	104½	.....	
Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121½		Brooklyn & 7th Ave. 3d mtg. 5s	500,000	500,000	1914	J. & J.	108	110	.....	
Bal. Trac. Co. Coll. Trust. 1st mtg. g. 5s	750,000	.....	1900	J. & J.	101	.....		Brooklyn Surface 1st mtg. 5s	1,125,000	1,125,000	1924	.....	115	117	.....	
Baltimore Traction Co. Convertible 5s	800,000	.....	1906	N. & M.	102½	.....		Brooklyn Surface 2d mtg. 5s	1,000,000	1,000,000	1905	.....	105	106	.....	
Central Pass. Ry. Co. 1st mtg. 6s	96,000	117,000	1912	J. & J.	.....	.....		Brooklyn City RR. Co. 1st cons. mtg. 5s	6,000,000	6,000,000	1941	J. & J.	116	117	.....	
Central Pass. Ry. Co. Cons. mtg. g. 5s	604,000	580,000	1902	M. & N.	119	121		Brooklyn City & Newtown 1st mtg. 5s	2,000,000	2,000,000	1939	J. & J.	115	116	.....	
City & Suburban Ry. Co. 1st mtg. g. 5s	8,000,000	8,000,000	1922	J. & D.	116	117		Brooklyn Bath & W. E. RR. Gen. mtg. 5s	1,000,000	448,000	1938	J. & J.	101	.....	.....	
Lake Roland Elev. 1st mtg. 5s	1,000,000	1,000,000	1942	M. & S.	117	.....		Brooklyn Heights RR. 1st mtg. 5s	250,000	250,000	1941	A. & O.	104	.....	.....	
All of the bonds of the above companies, marked f, have been assumed by the United Railways & Electric Company.								Brooklyn Q's Co. & Sub'n. 1st mtg. 5s	8,500,000	8,500,000	1941	J. & J.	112	.....	.....	
								Brooklyn Q's Co. & Sub'n. 2d mtg. 5s	4,500,000	2,750,000	1941	M. & N.	107	.....	.....	
								Brooklyn Rapid Transit. gold 5s	7,000,000	5,181,000	1945	.....	109½	110½	.....	
								Brooklyn Rapid Transit. 1st mtg. 7s	700,000	700,000	1900	.....	98½	100½	.....	
								Brooklyn Rapid Transit. 2d mtg. 7s	1,200,000	1,200,000	1902	J. & D.	107	109	.....	
								Brooklyn Rapid Transit. 3d mtg. 7s	250,000	250,000	1922	M. & N.	125	.....	.....	
								Brooklyn Rapid Transit. 4th mtg. 7s	800,000	800,000	1908	J. & J.	101	108	.....	
								Brooklyn Rapid Transit. 5th mtg. 7s	1,000,000	980,000	1912	J. & D.	117	120	.....	
								Brooklyn Rapid Transit. 6th mtg. 7s	1,000,000	1,000,000	1914	F. & A.	102	108	.....	
								Brooklyn Rapid Transit. 7th mtg. 7s	1,000,000	1,000,000	1916	F. & A.	108	.....	.....	
								Brooklyn Rapid Transit. 8th mtg. 7s	1,000,000	1,000,000	1918	M. & S.	116½	117	.....	
								Brooklyn Rapid Transit. 9th mtg. 7s	1,000,000	1,000,000	1920	J. & J.	117	118	.....	
								Brooklyn Rapid Transit. 10th mtg. 7s	1,000,000	1,000,000	1922	J. & J.	118	119	.....	
								Brooklyn Rapid Transit. 11th mtg. 7s	1,000,000	1,000,000	1924	J. & J.	119	120	.....	
								Brooklyn Rapid Transit. 12th mtg. 7s	1,000,000	1,000,000	1926	J. & J.	120	121	.....	
								Brooklyn Rapid Transit. 13th mtg. 7s	1,000,000	1,000,000	1928	J. & J.	121	122	.....	
								Brooklyn Rapid Transit. 14th mtg. 7s	1,000,000	1,000,000	1930	J. & J.	122	123	.....	
								Brooklyn Rapid Transit. 15th mtg. 7s	1,000,000	1,000,000	1932	J. & J.	123	124	.....	
								Brooklyn Rapid Transit. 16th mtg. 7s	1,000,000	1,000,000	1934	J. & J.	124	125	.....	
								Brooklyn Rapid Transit. 17th mtg. 7s	1,000,000	1,000,000	1936	J. & J.	125	126	.....	
								Brooklyn Rapid Transit. 18th mtg. 7s	1,000,000	1,000,000	1938	J. & J.	126	127	.....	
								Brooklyn Rapid Transit. 19th mtg. 7s	1,000,000	1,000,000	1940	J. & J.	127	128	.....	
								Brooklyn Rapid Transit. 20th mtg. 7s	1,000,000	1,000,000	1942	J. & J.	128	129	.....	
								Brooklyn Rapid Transit. 21st mtg. 7s	1,000,000	1,000,000	1944	J. & J.	129	130	.....	
								Brooklyn Rapid Transit. 22nd mtg. 7s	1,000,000	1,000,000	1946	J. & J.	130	131	.....	
								Brooklyn Rapid Transit. 23rd mtg. 7s	1,000,000	1,000,000	1948	J. & J.	131	132	.....	
								Brooklyn Rapid Transit. 24th mtg. 7s	1,000,000	1,000,000	1950	J. & J.	132	133	.....	
								Brooklyn Rapid Transit. 25th mtg. 7s	1,000,000	1,000,000	1952	J. & J.	133	134	.....	
								Brooklyn Rapid Transit. 26th mtg. 7s	1,000,000	1,000,000	1954	J. & J.	134	135	.....	
								Brooklyn Rapid Transit. 27th mtg. 7s	1,000,000	1,000,000	1956	J. & J.	135	136	.....	
								Brooklyn Rapid Transit. 28th mtg. 7s	1,000,000	1,000,000	1958	J. & J.	136	137	.....	
								Brooklyn Rapid Transit. 29th mtg. 7s	1,000,000	1,000,000	1960	J. & J.	137	138	.....	
								Brooklyn Rapid Transit. 30th mtg. 7s	1,000,000	1,000,000	1962	J. & J.	138	139	.....	
								Brooklyn Rapid Transit. 31st mtg. 7s	1,000,000	1,000,000	1964	J. & J.	139	140	.....	
								Brooklyn Rapid Transit. 32nd mtg. 7s	1,000,000	1,000,000	1966	J. & J.	140	141	.....	
								Brooklyn Rapid Transit. 33rd mtg. 7s	1,000,000	1,000,000	1968	J. & J.	141	142	.....	
								Brooklyn Rapid Transit. 34th mtg. 7s	1,000,000	1,000,000	1970	J. & J.	142	143	.....	
								Brooklyn Rapid Transit. 35th mtg. 7s	1,000,000	1,000,000	1972	J. & J.	143	144	.....	
								Brooklyn Rapid Transit. 36th mtg. 7s	1,000,000	1,000,000	1974	J. & J.	144	145	.....	
								Brooklyn Rapid Transit. 37th mtg. 7s	1,000,000	1,000,000	1976	J. & J.	145	146	.....	
								Brooklyn Rapid Transit. 38th mtg. 7s	1,000,000	1,000,000	1978	J. & J.	146	147	.....	
								Brooklyn Rapid Transit. 39th mtg. 7s	1,000,000	1,000,000	1980	J. & J.	147	148	.....	
								Brooklyn Rapid Transit. 40th mtg. 7s	1,000,000	1,000,000	1982	J. & J.	148	149	.....	
								Brooklyn Rapid Transit. 41st mtg. 7s	1,000,000	1,000,000	1984	J. & J.	149	150	.....	
								Brooklyn Rapid Transit. 42nd mtg. 7s	1,000,000	1,000,000	1986	J. & J.	150	151	.....	
								Brooklyn Rapid Transit. 43rd mtg. 7s	1,000,000	1,000,000	1988	J. & J.	151	152	.....	
								Brooklyn Rapid Transit. 44th mtg. 7s	1,000,000	1,000,000	1990	J. & J.	152	153	.....	
								Brooklyn Rapid Transit. 45th mtg. 7s	1,000,000	1,000,000	1992	J. & J.	153	154	.....	
								Brooklyn Rapid Transit. 46th mtg. 7s	1,000,000	1,000,000	1994	J. & J.	154	155	.....	
								Brooklyn Rapid Transit. 47th mtg. 7s	1,000,000	1,000,000	1996	J. & J.	155	156	.....	
								Brooklyn Rapid Transit. 48th mtg. 7s	1,000,000	1,000,000	1998	J. & J.	156	157	.....	
								Brooklyn Rapid Transit. 49th mtg. 7s	1,000,000	1,000,000	2000	J. & J.	157	158	.....	
								Brooklyn Rapid Transit. 50th mtg. 7s	1,000,000	1,000,000	2002	J. & J.	158	159	.....	
								Brooklyn Rapid Transit. 51st mtg. 7s	1,000,000	1,000,000	2004	J. & J.	159	160	.....	
								Brooklyn Rapid Transit. 52nd mtg. 7s	1,000,000	1,000,000	2006	J. & J.	160	161	.....	
								Brooklyn Rapid Transit. 53rd mtg. 7s	1,000,000	1,000,000	2008	J. & J.	161	162	.....	
								Brooklyn Rapid Transit. 54th mtg. 7s	1,000,000	1,000,000	2010	J. & J.	162	163	.....	
								Brooklyn Rapid Transit. 55th mtg. 7s	1,000,000	1,000,000	2012	J. & J.	163	164	.....	
								Brooklyn Rapid Transit. 56th mtg. 7s	1,000,000	1,000,000	2014	J. & J.	164	165	.....	
								Brooklyn Rapid Transit. 57th mtg. 7s	1,000,000	1,000,000	2016	J. & J.	165	166	.....	
								Brooklyn Rapid Transit. 58th mtg. 7s	1,000,000	1,000,000	2018	J. & J.	166	167	.....	
								Brooklyn Rapid Transit. 59th mtg. 7s	1,000,000	1,000,000	2020	J. & J.	167	168	.....	
								Brooklyn Rapid Transit. 60th mtg. 7s	1,000,000	1,000,000	2022	J. & J.	168	169	.....	
								Brooklyn Rapid Transit. 61st mtg. 7s	1,000,000	1,000,000	2024	J. & J.	169	170	.....	
								Brooklyn Rapid Transit. 62nd mtg. 7s	1,000,000	1,000,000	2026	J. & J.	170	171	.....	
								Brooklyn Rapid Transit. 63rd mtg. 7s	1,000,000	1,000,000	2028	J. & J.	171	172	.....	
								Brooklyn Rapid Transit. 64th mtg. 7s	1,000,000	1,000,000	2030	J. & J.	172	173	.....	
								Brooklyn Rapid Transit. 65th mtg. 7s	1,000,000	1,000,000	2032	J. & J.	173	174	.....	
								Brooklyn Rapid Transit. 66th mtg. 7s	1,000,000	1,000,000	2034	J. & J.	174	175	.....	
								Brooklyn Rapid Transit. 67th mtg. 7s	1,000,000	1,000,000	2036	J. & J.	175	176	.....	
								Brooklyn Rapid Transit. 68th mtg. 7s	1,000,000	1,000,000	2038	J. & J.	176	177	.....	
								Brooklyn Rapid Transit. 69th mtg. 7s	1,000,000	1,000,000	2040	J. & J.	177	178	.....	
								Brooklyn Rapid Transit. 70th mtg. 7s	1,000,000	1,000,000	2042	J. & J.	178	179	.....	
								Brooklyn Rapid Transit. 71st mtg. 7s	1,000,000	1,000,000	2044	J. & J.	179	180	.....	
								Brooklyn Rapid Transit. 72nd mtg. 7s	1,000,000	1,000,000	2046	J. & J.	180	181	.....	
								Brooklyn Rapid Transit. 73rd mtg. 7s	1,000,000	1,000,000	2048	J. & J.	181	182	.....	
								Brooklyn Rapid Transit. 74th mtg. 7s	1,000,000	1,000,000	2050	J. & J.	182	183	.....	
								Brooklyn Rapid Transit. 75th mtg. 7s	1,000,000	1,000,000	2052	J. & J.	183	184	.....	
								Brooklyn Rapid Transit. 76th mtg. 7s	1,000,000	1,000,000	2054	J. & J.	184	185	.....	
								Brooklyn Rapid Transit. 77th mtg. 7s	1,000,000	1,000,000	2056	J. & J.	185	186	.....	
								Brooklyn Rapid Transit. 78th mtg. 7s	1,000,000	1,000,000	2058	J. & J.	186	187	.....	
								Brooklyn Rapid Transit. 79th mtg. 7s	1,000,000	1,000,000	2060	J. & J.	187	188	.....	
								Brooklyn Rapid Transit. 80th mtg. 7s	1,000,000	1,000,000	2062	J. & J.	188	189	.....	
								Brooklyn Rapid Transit. 81st mtg. 7s	1,000,000	1,000,000	2064	J. & J.	189	190	.....	
								Brooklyn Rapid Transit. 82nd mtg. 7s	1							

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bid.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—Apr 29 1901						
Anderson Avenue Ry.....1st mtg. 5s.	270,000	270,000	1905	M. & N.	102	113
Lindell Ry. Co.....1st mtg. 5s.	1,000,000	1,500,000	1911	F. & A.	107	118
Missouri RR. Co.....	1,000,000	700,000	1916	M. & S.	105	106
Mount City RR. Co.....1st mtg. 6s.	400,000	800,000	1910	A. & O.	104½	105½
People's RR. Co.....1st mtg. 6s.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 7s.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric. 1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
St. Louis & Sub. Ry.....1st mtg. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5s.	800,000	800,000	.....	.....	80	84
Southern Electric Ry.....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
Taylor Avenue St. Ry.....1st mtg. 6s.	500,000	500,000	1918	J. & J.	116½	117½
Union Depot RR. Co.....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.....Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122
Controlled by St. Louis RR. Co.						
Controlled by Union Depot RR. Co.						
Controlled by Lindell RR. Co.						
\$200,000 in escrow to retire 1st & 2d mtg.						
\$800,000 in escrow.						
\$200,000 in escrow to retire 1st mtg. 6s.						
San Francisco Cal.						
Date of Quotation—Apr 29 1901.						
California St. Cable RR.....1st mtg. 5s.	1,000,000	900,000	1915	J. & J.	114	117
Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	.....	117
Geary St., Park & Ocean RR. 1st mtg. 5s.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. 6s.	8,000,000	8,000,000	1918	J. & J.	126½	.....
Metropolitan Ry. Co.....1st mtg. 5s.	200,000	.....	.....	.....	.....	.....
Omnibus Cable Co.....1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	.....
Park & Cliff House RR.....1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
Park & Ocean RR.....1st mtg. 6s.	250,000	250,000	1914	J. & J.	115	.....
Powell St. Ry.....1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Utter St. Ry. Co.....1st mtg. 5s.	1,000,000	900,000	1918	M. & N.	.....	.....
Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—Apr 29 1901						
Belt Ry. Co.....Cons. mtg. 5s.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 6s.	500,000	500,000	1914	A. & O.	182	.....
Eckington & Soldiers' Home Ry. 1st mtg. 6s.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	.....	.....
\$50,000 in escrow to retire 1st mtg. 6s.						
Miscellaneous						
Date of Quotation—Apr 29 1901						
Bridgeport Traction Co.....1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 5s.	5,000,000	8,548,000	1981	F. & A.	118	.....
Chickens St. R. (Ind'polis). 1st cons. m. 5s.	4,000,000	8,000,000	1988	M. & N.	104	108
Cromwell St. Ry. (Buffalo). 1st mtg. 5s.	8,000,000	2,866,000	1982	M. & N.	112	118
Columbus (O.) St. Ry.....1st cons. g. 5s.	8,000,000	2,261,000	1982	J. & J.	118	.....
Consolidated Traction (N. J.). 1st mtg. 5s.	15,000,000	18,965,000	1988	J. & D.	111½	111½
Cross'n St. Ry. (Colo.). 1st mtg. g. 5s.	2,000,000	572,000	1988	J. & D.	115	116½
Denver City Cable Ry.....1st mtg. 6s.	4,000,000	8,800,000	1920	J. & J.	20	85
Denver Con. Tram'y Co.....Con. m. g. 5s.	4,000,000	922,000	1988	A. & O.	80	85
Louisville (Ky.) Ry.....1st cons. mtg. g. 5s.	6,000,000	4,981,000	1980	J. & J.	119	119½
Minneapolis St. Ry. 1st cons. mtg. g. 5s.	5,000,000	4,050,000	1919	J. & J.	110½	110½
No. Hudson Co. Ry. (N. J.). Cons. mtg. 5s.	8,000,000	2,878,000	1928	J. & J.	108	.....
N. Hudson Co. Ry. (N. J.). 2d mtg. 5s.	550,000	550,000	1928	M. & N.	.....	.....
N. Hudson Co. Ry. (N. J.). Deb. 6s.	500,000	489,000	1902	F. & A.	.....	.....
Paerson (N. J.) Ry.....Cons. mtg. g. 6s.	1,250,000	1,000,000	1981	J. & D.	.....	.....
Paerson (N. Y.) Ry.....1st mtg. 6s.	8,000,000	2,000,000	1980	A. & O.	.....	.....
St. Paul City Ry.....Cons. g. 5s.	5,500,000	4,298,000	1987	J. & D.	105½	108
St. Paul City Ry.....Deb. g. 6s.	1,000,000	1,000,000	1900	.....	108	.....
\$1,000,000 in escrow to retire 1st and 2d mtg. 6s.						
\$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
\$500,000 in escrow to retire bonds of C. St. RR. Co.						
\$87,000 in treasury.						
\$900,000 res'ed to redeem prior liens						
\$620,000 in escrow.						

*With int' res

ELECTRIC LIGHT AND ELECTRICAL MFG. CO'S

Boston, Mass.						
Date of Quotation—Apr 29 1901						
Delaware Gas Lt. Co. 1st m. 5s. g.	800,000	800,000	.....	J. & J.	106	108
Edison Elec. Illuminating Co., Boston.	2,026,000	.....	.....	Quar.	187	.....
General Electric Co. gold coup. deb. 5s.	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa.						
Date of Quotation—Apr 29 1901						
Allegheny County Light Co. 6s.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Scrip 6s.	195,570	.....	.....	M. & S.	.....	.....
Miscellaneous. —(Apr 2, 1901)						
Edison El. Ilig. Co. (N. York) 1st m. 5s.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilig. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1998	.....	124	.....
Edison Elec. Ilig. Co. (Brooklyn)	5,000,000	5,000,000	1940	.....	122½	124
Edison Electric Light (Philadelphia) ..	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Po. Co. 1st mtg. 5s.	2,500,000	.....	1987	A. & O.	100	101
Kings Co. El. Lt. & Po. Co. pur. money 6s.	5,176,000	.....	1997	A. & O.	120	122
Milwaukee El. Ry. & Lt. Co. 1st con. g. 5s.	8,000,000	.....	.....	F. & A.	102½	.....
United Elec. Light & Power Co. (N. Y.) ..	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous						
Date of Quotation—Apr 29 1901						
American Bell Telephone. 4s.	.....	.....	1908	F. & A.	100½	101
Northwestern Telegraph Co. 7s.	.....	.....	.....	.....	114	115
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 5s.	.....	.....	1911	J. & D.	108	116
Chesapeake & Potomac Teleph. Co. 5s.	.....	.....	.....	.....	.....	.....

ALLIED INDUSTRIES.

Miscellaneous						
Date of Quotation—Apr 29 1901						
American Electric Heating. 7s	500,000	500,000	.....	.....	.....	25
Armington & Sims Engine Co. 6s.	.....	.....	1923	J. & J.	106	107
Barney & Smith Car Co. 6s.	.....	.....	1904	J. & D.	.....	.....
Corbendum Mfg. Co. 6s.	.....	.....	.....	.....	115	127
Washington Pump Co. 6s.	75,000	.....	.....	.....	.....	.....
Galileo	.....	.....	.....	.....	.....	.....

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16¾c.; Lake, 17@17½c.; casting, 16½@16¾c.

The dividend and interest disbursements in Boston May 1 foot up a total of \$5,111,615.

The annual meeting of the New England Telephone Company takes place in New York the first Monday in May.

The United Telephone and Telegraph Company has given a mortgage to the Equitable Trust Company of Philadelphia for \$2,000,000.

The Denver (Col.) City Tramway Company has declared a quarterly dividend of 1 per cent., payable May 16 to stock of record May 6.

The American District Telegraph Company has declared a dividend of 1 per cent., payable May 15. Books close May 6 and reopen May 15.

Directors of the Westinghouse Electric Company have declared the regular quarterly dividend of 1½ per cent., upon the assenting stock, payable May 15.

The Brooklyn Rapid Transit Railway Company reports for March: Gross earnings, \$955,504; operating expenses and taxes, \$714,044; net earnings, \$241,450.

The West Chicago Street Railway Company has declared the regular quarterly dividend of 1½ per cent., payable May 15. Books close May 4 and reopen May 16.

It is rumored that the capital stock of the Chicago Edison Company will be increased 15 per cent. some time this year and be offered to the stockholders at par.

The report of the Mexican Telephone Company for the year ended February 28 (dollars in Mexican currency) shows: Gross earnings, \$187,466; operating expenses, \$102,635; net earnings, \$84,831.

Plans have been completed for the consolidation of a number of traction lines in Northwestern Pennsylvania. The merger will result in the building of a through line between Erie, Pa., and Youngstown, O.

The San Francisco and San Mateo Electric Railway has been purchased by a syndicate composed of Baltimore, Md., men, for \$1,600,000. The road has a capital stock of \$1,000,000 and its gross earnings have been about \$225,000 a year.

Copper during the past week was quiet, but prices remained unchanged. The exports continue small. The London market, however, was weak, declining £1 in the last two days of the week, which is remarkable, when the exports from this country are so small.

C. D. Simpson, of New York, has bought at a foreclosure sale for \$50,000 the Cortland & Homer (N. Y.) Traction Company and the Cortland & Homer Electric Company. At this low price many of the smaller stockholders, unable to protect their holdings are wiped out, with ruinous loss.

The following are quotations for some of the industrial stocks not quoted elsewhere: Electrical Lead Reduction, 4¼@5; Electric Boat, 18@21; Electric Vehicle, 10@13; Tel. & Tel. Company of America (full paid) 6@6½; Electric Company of America, 9@9¼; National Carbon, 15¼@15½.

An official of the Boston Electric Light Company is reported as saying: "Judging from the present progress made in matters relative to a consolidation of the Boston and Edison electric light companies there is little prospect of a merger of the two companies before next July. In the meantime there will be another dividend declaration by our directors."

The Chicago Edison Company's report for the fiscal year ended March 30 will not be ready probably for two weeks. The annual meeting will be held June 10. Officials say that the net earnings have been gratifying in comparison with the preceding year, when a surplus after bond interest and dividends amounting to \$149,075 was carried forward.

A prominent financial interest says: "There has been some talk by interests in the American Railways Company and in the Electric Company of America about the advisability of forming a plan to combine both companies with one or more other companies. As yet this talk has not taken any definite form, and the question of terms, which would be proposed to stockholders if the plan went through has not been settled."

The latest electric railroad to be perfected is one from Dansville to Rochester, N. Y., down the Genesee Valley, and it will be known as the Rochester and Southern Traction Company. It will be 60 miles in length and is intended for freight and passenger business. The equipment will be made for handling heavy business and speed. To start with, the corporation will be capitalized at \$1,000,000. Satisfactory progress has already been made in securing right of way and franchises.

Advices from Philadelphia state that the surplus reported by the Electric Company of America at the close of 1899 was \$838,925, and profit and loss in 1900 gives balance brought forward as \$742,045. This difference, nearly \$100,000, is explained by officials of the company to be due to writing off for depreciation. At the present time the company is understood to have about \$500,000 more actual cash in hand than is shown by the statement, which is as of December 31, making the entire amount to date about \$900,000. This is due to the fact that the proceeds from the sale of the Camden plant do not figure in the December 31 statement.

The General Electric Company has declared the regular semi-annual dividend of \$3.50 a share on the preferred stock. This, says a dispatch from Boston, was probably done to enable the stockholders to participate in a final dividend prior to the exchange of the stock for common as provided for in the circular recently issued. The circular names August 1 as the date on which all stock to be exchanged must be deposited and the selection of the same date for the payment of the dividend is probably done to make a final payment upon the day the stock ceases to exist. The exchange of preferred stock for common will give stockholders of the former 8 per cent., instead of 7 per cent. now paid.

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EDITORIAL NOTES.

Programme for the Niagara Falls Meeting.

Judging from the prelimin-
ary programme just issued
for the Twenty-Fourth con-
vention of the National
Electric Light Association,
the meeting at Niagara
Falls on May 21, 22 and 23 should be a most in-
structive and interesting one. Six papers will
be presented on the following subjects:

"Arc Lighting at the Beginning of the
Twentieth Century," "Storage Batteries in
Central Stations," "The Practical Side of the
Incandescent Lamp," "The Foresee (4-C) Sys-
tem of Charging," "A Station Load Diagram,"
"Distribution of Current at High Potential
in New York City."

Besides these papers food for thought will
be furnished by the Committees on Grounded
Circuits, Rules for Electrical Construction and
Operation, Standard Candle Power of Incan-
descent Lamps, Photometric Values of Arc
Lamps, Analysis of Flue Gases, The Legisla-
tion Regarding Theft of Current, Amendments
to By-Laws, Amendments to Freight Clas-
sification of Electrical Apparatus, Legislative
Policy, Uniform Accounting, and Steam Heat-
ing from Central Stations.

As the dedicatory ceremonies of the Pan-
American Exposition will be held May 20, dele-
gates to the Convention will be afforded an op-
portunity of witnessing the event.

* * *

Opening of the Pan-American Exposition.

The Pan-American Expo-
sition was opened on May
1, as scheduled, in spite of
the fact that some finish-
ing touches were needed
to complete the buildings
and make the grounds perfect. The pro-
gramme of the opening day was not extensive,
but included some very interesting features.
There was an address by Col. J. H. Brigham,
chairman of the Government Board, on the
opening of the Government Building, concerts
by two military bands, both in the afternoon
and evening, and a grand electrical illumina-
tion of all the buildings of the Exposition.
The regular opening exercises are to be held on
the 20th day of May at the same time as the
dedication exercises, and on this occasion
many interesting features will be introduced,
including processions, speeches by prominent
officials, etc.

The illuminating effects at the Pan-Amer-
ican Exposition probably surpass anything of a
similar nature heretofore attempted. The
electrical energy required to operate the
thousands of incandescent lamps and the
numerous searchlights as well as the many
pieces of electrical machinery is derived prin-
cipally from Niagara Falls, which is fast be-
coming known the world over for its vast re-
sources in available power for commercial pur-
poses. The Niagara Falls Power Company,
which has control of most all of the available
power, has now in operation ten turbines of
5,000 horse power each and has awarded a con-
tract for six more turbines of the same capac-
ity. This new machinery including the gen-
erators is expected to be in place by May 20,
ready to assist in the delivery of power to the
Exposition.

All of the lighting circuits are controlled
from the Electricity Building. The arc lights
about the outer edge of the grounds and else-
where are supplied from fifteen constant cur-
rent machines. For 110 volt direct current in-
candescent lighting two 100 kilowatt direct
current machines have been provided, together
with a 180 kilowatt, and a 600 kilowatt, sixty
cycle alternator. The 500 volt power circuit
is operated by four direct current machines of
a total capacity of 1,000 kilowatts.

All of the principal electrical manufacturers
have space either in the Transportation Build-
ing or in the Electricity Building, and when
all of the exhibits are properly arranged and
in working order, they will undoubtedly make
a very fine showing and favorably impress
visitors from the South American countries.

* * *

The Electrical Equipment of the Elevated Roads.

It now really seems as
though rapid transit, at
least so far as the elevated
railroads of this city are
concerned, is in sight. At
stated intervals during the
past several years rumors have been circulated
to the effect that the Manhattan Elevated
Railroad Company proposed to change its mo-
tive power from steam to electricity. These
reports served to buoy up the hopes of the
people for some time, but no definite steps
were taken until the erection of the power
station near the East River was begun about a
year ago.

Now it is announced that the Manhattan
Company has closed a contract with the Gen-
eral Electric Company for all the necessary

electrical traction apparatus for equipping its elevated lines. This contract involves electrical supplies and machinery worth approximately \$3,000,000, and is said to be the largest ever awarded to any electrical company.

With a view to adopting the best system or method of train control the Manhattan Elevated Railroad Company caused an experimental line to be built along its Second Avenue road from 65th to 94th street. On this stretch of track various experiments and tests were made, and it is therefore after mature deliberation, that the contract was awarded.

As will be recalled, about a year ago the Manhattan Company awarded the contract for the electrical equipment of its power house to the Westinghouse Company. The contract entered into last week is for the rolling stock equipment only, and it specifies that the motors and other apparatus shall be delivered within ninety days.

The Manhattan officials hope to operate the third-rail system before the summer passes; but granting time for all delays the officials declare positively that the whole elevated system will be operated by electricity before the end of summer or not later than the early fall.

The contract with the General Electric Company is for the complete electric equipment of the trains throughout the system. The contract specifies the multiple unit train control, with motors for 800 main cars and half that number of trailers. As each motor car will have two motors, there will be 1,600 motors for these cars alone.

It was said that the chief reason for the delay in equipping the Manhattan lines has been caused, not by the failure of the contractors, but because of the difficulty which the Westinghouse Company has encountered in obtaining a sufficiently large boring machine, which a Philadelphia concern has been engaged in making.

From the above it may be inferred that not later than this time next year, the power house will be completed, and the entire system will be electrically-equipped and free from dust, smoke and cinder-producing steam locomotives, which, needless to say, will be appreciated by the public.

* * *

Electricity for the Miami & Erie Canal.

There are a number of canals on the Continent of Europe on which the barges are towed by means of electric haulers running along the banks. From present indications it will not be very long before the principal canals on this side of the Atlantic will be operated in the same way, and as the horse gradually disappeared from in front of street cars, so will the mule become conspicuous by its absence from the tow rope of canal boats.

A number of Cleveland and Cincinnati capitalists are financing a company that proposes to propel canal boats by electricity from Toledo to Cincinnati. The name of the organization, which has a capital stock of \$3,000,000, is the Miami & Erie Canal Transportation Company.

It is the purpose of the new company to construct tracks along the towpath of the Miami & Erie Canal, on which small electric locomotives or haulers will be operated. The motors will take the place of mules for towing the canal boats. It is claimed that this method is much more economical than animal power. Under the old method each boat required a

crew of two or more persons, quarters for stabling at least two mules, and it was not possible to tow more than one boat at a time.

With the electric system it is expected that from one to six canal boats can be towed at the same time, while not more than two men will be required for the entire fleet, and if only one boat is to be towed, not more than one man will be required. The quarters now used for stabling purposes can be devoted to the storing of freight; thus the boats can be operated at a decreased cost, and at the same time carry more tonnage. With horse power it takes several days for a boat to go from Cincinnati to Toledo, but it is estimated that with electricity the trip can be made in less than twenty-four hours. The shallowness of the canal would prevent a higher rate of speed.

Referring to the plans of the company Mr. W. H. Lamprecht, the president, is reported as saying:

"We expect to have the system between Cincinnati and Dayton completed and in operation by September or October. The large shippers along the line of the proposed improvement are enthusiastic over the proposition, and if only one-half of the freight that has been promised to the company is ultimately handled by it, we will have even more business than we even expected. As soon as possible after the completion of the Cincinnati-Dayton line, the system will be extended to Toledo."

It is understood that the company has obtained the right through the Ohio Legislature to build the tracks along the towpath.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

MR. C. W. S. CRAWLEY brought before the London Institution of Electrical Engineers on April 18 a contribution entitled "Note on the Use of Differential Galvanometer," in which he endeavored to say a few words in favor of an old but very effective instrument, which has fallen into disuse, and to show a practical way of using it for modern work. Mr. Crawley does not suggest that the differential galvanometer should be used for ordinary accurate coil work, as the Carey Foster method is perfect for that. He has never sanctioned any accurate coils between 1 and 10,000 being finally tested by any other method; but below 1 ohm it is invaluable, and it makes quite easy a good deal of special work which would not be practical commercially by any other method.

MR. STEPHEN L. COLES, well known in electrical circles and who has been engaged in technical journalism for a number of years, has associated himself with Mr. M. J. Shaughnessy in a business which will consist in preparing and publishing technical and trade literature for firms in need of such services. Their offices will be located in Temple Court, 5 Beekman street, New York.

A LONDON dispatch says a strange fatality appears to surround the Yerkes Hampstead and Charing Cross underground line. One after another the lieutenants in charge of the undertaking have resigned for no apparent reason. First Mr. Lauderbach, who had been Mr. Yerkes' right hand man for years, discovered

that the London climate was unsuitable. Then Mr. Davis, who engineered the deal originally, suddenly severed his connection and returned to New York. Saturday Mr. Howard Abel, who was especially brought from Chicago to superintend the work, resigned too, but declined to make public his reason. He will await the arrival of Mr. Yerkes in London next month before returning to America. This leaves only Mr. Chapman, the engineer, to look after affairs.

FRANK D. HILL, the United States Consul at Amsterdam, informs the State Department at Washington, that H. R. der Mosch and H. Jul Joostenz, of Bavaria, Java, have been granted a thirty-year concession for the erection of electric light and power plants in the cities of Padang and Djokjakarta. Padang, says the consul, is the largest city of the west coast of Sumatra and has a population of about 35,000. Djokjakarta contains 85,500 people and may be reached by rail from Samarang.

It is stated that a San Jose, Cal., man is about to introduce a pacing machine in that city, which is to be driven by an electric current from an overhead trolley wire.

THE London "Engineer" states that several French syndicates have planned the development of the water power of the Rhone, and extensive plants are to be erected within the next three years between Pymont and the Swiss frontier. The first of these projects is that of Malpertuis, 2½ miles below Bellegarde, where the river falls 30 feet to 35 feet, with perpendicular banks only 160 feet apart. By building a tunnel 1.2 miles long, a total fall of 51 feet to 55 feet can be secured, equivalent to 25,000 hp. at low water. Near Bellegarde another tunnel would secure a fall of 80 feet to 85 feet, developing 30,000 hp., and about 8 miles from the Swiss frontier is a narrow gorge only 80 feet wide, and a dam built here would give a fall of 65 feet, or 30,000 hp. at low water.

At a recent meeting of the Commissioners of the Park Department in this city new rules for automobiles in Central Park were announced. Seven miles an hour is to be the maximum rate of speed hereafter for these machines, and when a horse comes in sight, going in the opposite direction, this rate must be reduced by one-half. Commissioner Clausen said that the object of the rule was to lessen the danger of runaways and accidents. The steam driven machine is the one particularly aimed at. The automobiles driven by electrical power have been in the parks so long that the average horse has become accustomed to them, but the steam driven vehicle, hissing and buzzing along, is trying on the nerves of the high strung animals.

SINCE the perfection of the Marconi telegraph a good deal has been written in the untechnical press as to inventions which have been made by numbers of experts for the steering of torpedoes, without providing any connecting wire between the torpedo and the ship which has dispatched it. We do not suggest that the inventors have not given thought to the question, says the "Electrical Engineer," London, but we do not think the public properly understand the real difficulties in the way. The difficulty is not so much in the

steering of the torpedo—which has already been done through a wire trailed behind the same, or paid out from the torpedo as it moves—as in knowing exactly where the torpedo is at any instant in order that the control may be varied to bring the same up to the desired target. When the distance between the torpedo boat and the torpedo exceeds a mile, a large marker on the torpedo projecting above the water-line is required to enable its whereabouts to be determined. Unfortunately, as the torpedo approaches the target, which in war time would be a ship, this marker would be more easily seen from this vessel than it would be from the torpedo boat which is steering the torpedo. The difficulties in the way of a successful solution of the problem are, therefore, exceedingly great, especially when one takes into consideration the action of currents, which varies with the tides. The sending of a signal to alter the position of the helm of a torpedo is an easy matter, but it does not follow that the difficulties in steering a torpedo on a desired course have been overcome in consequence.

The strike of the tramway employees in Barcelona, Spain, is becoming more serious. The strikers tried to tear up the tramway track but were driven off by gendarmes, who opened fire on the mob.

The Forty-five mine of the Monte Cristo district, tributary to Everett, Wash., is making some important changes in the method of operating its 36,600 foot tramway leading from the mine to Silverton, the point of shipment on the Monte Cristo Railroad. Hitherto the tramway has been operated by water power furnished by the Stillaguamish River, on the Silverton side of the mountain, over which the road passes, with only one bearing at the summit. The plan has proved a failure. In the changes now under way the tram will be operated from the Forty-five side of the mountain by an electric motor with eight bearings on the summit of the mountain instead of one as before, and it is conceded by practical engineers that the plan will succeed.

The State Department has received a communication from Horace N. Allen, the United States Minister to Korea, saying that an American firm has received the contract to construct a highway in that country 18 miles long to cost \$141,930, and for the extension along this road of the present electric street railway, to cost \$358,560, in connection with an electric lighting plant for the city of Seoul.

A GERMAN Imperial Commission has been carrying out experiments on the question of the consumption of coal dust in fire furnaces, and in the report which has recently been issued special mention is made of the Schwarzkopff apparatus. Some of the conditions peculiar to this arrangement are given in the "Journal" of the Society of Arts. In the first place it is stated that a highly heated fire chamber is necessary for the ignition of the coal dust, for the higher the temperature the quicker and more perfect will be the combustion. Contact with the boiler walls must be guarded against, as it interferes with ignition, and a fire chamber lined with fireproof material has also to be provided, because only such a chamber can be kept constantly at the required high temperature. It is pointed out that a fire chamber is

not an inconvenience, but rather a special advantage in coal dust firing, because it ensures a perfect combustion, a high temperature of the gases at the start, and protection against the formation of needle flames. Further, such a chamber offers for boiler firings in case of stoppage, the advantage that by the heat stored in the fireproof walls the steam pressure is longer maintained. The apparatus seems also to insure a smokeless combustion.

"LE PETIT BLEU" announces to the N. Y. "Herald" that King Leopold intends to create a network of electric railways, requiring a capital of a milliard of francs, to be constructed in the following order: Brussels to Antwerp, Brussels to Ostend and Brussels to Paris. According to the same authority the consent of the French Government has been secured.

According to a foreign contemporary there is a project on foot for the construction of a movable electric platform on the north side of the Seine in Paris. It will be underground, and its length will be about 6 miles. The route proposed passes under the Avenue de l'Opera, the boulevards, Boulevard Sebastopol, the Rue Turbigo and the Rue de Rivoli. The newscheme embraces four platforms instead of three, as was in use at the exhibition. The first platform will be stationary, the second will have a velocity of $1\frac{1}{2}$ meters a second, the third 3 meters, and the fourth 5 meters, or 16½ feet.

ELECTROLYSIS is used in the United States mint for the preparation of proof silver. Fine silver is subject to electrolytic action, using an electrolyte of silver-nitrate with 1 per cent. of free nitric acid. The bar of fine silver is closely wrapped in filter paper and again inclosed in cotton cloth, by which the impurities, such as peroxide of lead, etc., which accumulate as the bar is dissolved, are retained. The bar so protected is connected with the positive pole of the battery or other source of electricity, thus becoming the anode, while the cathode is formed by connecting a sheet of chemically pure silver to the negative pole. The silver is thrown down as crystals, which are easily washed. In this way pure silver, even in large quantities, can be easily prepared.

The Warkwitz process of metal plating has been talked about for some years, but particulars have so far hardly been available. According to a paper read by Sichelstiel, in the Nurnberg section of the Verein-Deutscher Ingenieure, it is a combined soldering and welding process. If plates of aluminum, says the "Engineering," London, which melts at 700 deg. C., and of copper, melting point about 1,100 deg. C., are placed upon one another and heated, the aluminum will unite with the copper. But it will form a hard, brittle alloy, rich in aluminum, which is of no use for binding a further layer of aluminum. At lower temperatures the two metals will not unite. Yet Warkwitz proceeds somewhat as described, but his aluminum sheet is exceedingly thin, forming, when pressed on hard, to avoid all oxidation of the copper, a copper alloy which contains very little of the other metal. This alloy welds under the rolls with other sheet aluminum, and thus the plating is accomplished. In the case of iron and steel the process is less simple; but, on the whole, the same method is applied for uniting any metals of widely differing melting points.

A WELSH electrician is said to have invented two X-ray tubes for which he claims several advantages over the ordinary tubes, especially that they are non-injurious, one of them actually tending to heal burns and wounds. One makes bones and not flesh visible on a photograph plate, while the other makes neither visible, the plate only showing foreign substances.

A COMBINATION of great magnitude among the telephone and telegraph companies in the United States is declared to be under consideration. The master minds in the enterprise are said to be President Mackey of the Commercial Cable and Postal Companies and Gov. W. Murray Crane, both of whom are among the largest stockholders in the American Telephone & Telegraph Company, the latter being one of the largest stockholders of the Western Union and, until he became Governor of Massachusetts, a director of the Western Union Company.

At the meeting of the executive committee of the International Association of Municipal Electricians held at Niagara Falls, N. Y., all arrangements were made for the annual convention of the organization to be held in that city this summer. The committee decided to hold the convention on September 2, 3 and 4. It will attract between 150 and 200 municipal electricians from all parts of the country.

The Metropolitan Street Railway Company of Kansas City and the Kansas City Electric Light Company recently let contracts for buildings and equipment amounting to \$1,500,000. The contract for the generators was let to the General Electric Company through its Chicago office; the contract for the boilers was secured by the Babcock & Wilcox Company.

A CABLE dispatch from London states that a Dr. Ludwig Mond has discovered a method of producing illuminating coal gas at two pence per thousand feet, which will effect a revolution by cheapening electric power.

The Board of Rapid Transit Commissioners at a meeting held last week decided to have the rapid transit trains enter the Bronx by means of a tunnel under the Harlem River, instead of on an elevated structure as was originally proposed.

The National Electric Light Association Convention.

The headquarters of the National Electric Light Association for the annual meeting to be held at Niagara Falls on May 21, 22 and 23, will be at the International Hotel, which has been entirely reserved for those attending the meeting. Rates, American plan, \$5 per day, with bath; \$4 per day without bath.

The respective Passenger Associations covering the territory east of the Mississippi River have granted a rate of a fare and one-third, on the certificate plan, for delegates and friends attending the Convention, from all points in their territory to Niagara Falls and return.

The dedicatory ceremonies of the Pan-American Exposition will be held on Monday, May 20, the day before the opening of the Convention, thus enabling members and delegates to attend within the time limit of their tickets.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 26.

SUGGESTIONS FOR THE TELEPHONE INSPECTOR.

A branch of the electrical industry which represents quite a proportion of the army of electrical workers is telephone inspection.

As stated before in these articles, it is practically impossible for one individual to master all the branches of the industry in a practical way, although a superficial knowledge of the entire science may be acquired by a thorough theoretical education; however, the practical side of the science represents numerous separate and distinct trades, of which telephone inspection is one, and one which, I believe, on an average commands as high a rate of salaries as any of the other branches.

During a recent conversation with the head of an inspection department in one of our large cities I made the inquiry as to what peculiar qualities or characteristics were most essential for a successful inspector. He replied, that of course first of all was a thorough knowledge of the telephone work, but this by no means constituted the only features requisite to success, as besides being competent to repair the troubles in telephones, if any existed, the inspector was also supposed to smooth out the subscriber's ruffled temper and to create a genial feeling of the subscriber toward the company which, in all probability may have been temporarily ruffled by the aggravating annoyance of an inoperative telephone. Then to do this and maintain a satisfactory atmosphere of congenial feeling, the inspector must, besides having good telephone ability, be a close student of human nature, quick of perception, of good address and be able to adapt himself intellectually to any change of surroundings, whether his duty calls him to the inspection of a telephone in a fish market or in the private office of a railroad president. Understand that the nature of the inspector's errand requires that the subscriber's views of the trouble encountered be secured, as four times out of five no specific or definite trouble exists but the inspector is sent to satisfy the whim of the subscriber who may have been only accidentally "cut off" when using the instrument or have been talking to a long noisy line, which will naturally interfere with and lessen the efficiency of the instrument. The subscriber does not know this and naturally ascribes the trouble to defects in his instrument and immediately in his annoyed state of mind sends for the inspector. In a case of this kind do you see the situation of the inspector? He must hear the version of the trouble from the subscriber, listen attentively and seriously to his ideas of where the trouble exists and how to fix it and agree with him, while he upbraids the heartlessness and oppression of monopolies. The inspector upon examination of the instrument and general deduction from the situation may find that no actual trouble exists, yet this must not be made known to the subscriber, but rather the impression conveyed that the trouble has been located and cleared, leaving the circuit in an entirely satisfactory condition. Although in

a majority of imaginary troubles this remedy is generally satisfactory, yet it will not suffice in every case, and the inspector must decide this by his ability to study human nature.

You will wonder wherein all these requirements are essential to the repairing of a telephone. They are not essential to the repairing of an instrument but are necessary accomplishments to the inspector, who of necessity encounters all these conditions, and as a result it becomes a part of the trade and must be cultivated and added as an adjunct to the telephone knowledge, to fulfill the requirements expected by a company of its employees hired in that capacity.

The supervising inspector besides enumerating these special features, which are necessary, emphasized them by a recital of several instances as an illustration.

One instance was where an operator on a branch exchange complained of not being able to hear well and sent for the inspector. After careful examination the inspector found the apparatus working properly, but noted the fact that the operator was suffering from a slight cold, which to some extent dulls the hearing, and concluded at once that the defect was with the operator rather than with the apparatus.

The fact that some trouble existed was firmly established in the operator's imagination, and the remedy for this was to reverse the direction of the operator's imagination, which could not be done by stating that no trouble existed. "Well, I should say you have been having trouble. Look at this receiver; some one has turned the diaphragm upside down. It is no wonder you could not hear. Try it now and I will talk to you from a 'phone close by and you will see how well it will work." The inspector called the operator from a convenient 'phone and of course talked clearly and distinctly and the operator attributed it to the repaired receiver. The operator actually heard better over the lines after that because her imagination was set working in that direction. Any telephonist knows that it makes practically no difference which side of a diaphragm is up. The inspector in this case actually cleared a piece of trouble, which, however, was imaginary, but that is what the telephone inspector is doing one-half the time, clearing imaginary troubles.

Another case worthy of note, to show where in an inspector must use his "Sherlock Holmes" ability, was where a subscriber continually complained of a cut-out in his instrument, but the inspector could never find any trouble on the circuit. The subscriber was so positive in his assertion that trouble existed that the inspector made special inquiries and after using considerable ingenuity discovered that occasionally, a man with an impediment in his speech answered a 'phone which this subscriber often called. The fact that the man stuttered gave the impression that there was a "cut-out" on the line. This may appear to be the funny side of the telephone inspector's duties, but nevertheless this funny side exists and becomes a part of his trade.

HOW TO TEST FOR TROUBLE.

The first thing to do when inspecting an instrument or looking for existing trouble is to examine the receiver and see that it is in perfect working condition. Remove the diaphragm and clean the ends of the magnets. As all tests are made by and depend on the re-

ceiver many misleading impressions might be conveyed if it was not in good working condition.

To find if a "frying" or scraping which exists is caused by the transmitter cut it in and out of the circuit, while listening, by short circuiting it on the binding posts or some other convenient points.

A scratching sound caused by defective cords may be discovered by moving the cords while listening on the circuit.

To find out whether a "cut out" is on the line or in the instrument place a test receiver in series with the line and while listening with it cut the instrument in and out of the circuit by short circuiting it at the line binding posts. If the "cut-out" exists after the instrument is short-circuited then it must be on the line.

To find out whether a battery is run down or not, short circuit the line and judge by the amount of "side tone" received. An examination of the batteries is more reliable however.

To test for a leak on the battery circuit, connect the test receiver in series with it and note if any current is flowing when the automatic hook is down.

To test to find if a line is grounded or not, connect one side of the battery to ground and the other side through the test receiver to the line, make and break the circuit to see if any current is flowing; if there is then the line must be grounded to complete the circuit of the battery.

To test a noisy line to see if it is perfectly balanced and transposed listen with the test receiver between each side and ground. If there is a difference in the amount of noise on each side then the line is either unbalanced or not effectually transposed.

If a line is either open or short-circuited it may be tested by the magneto on a general system line, but if a common battery circuit it may be easily discovered by the fact that no current will reach the instrument.

Article No. 27 will be entitled "Difference of Ground Potential and Its Effects."

SWITCHBOARDS.*

BY T. D. BOYLES, E. E.

I wish to bring to your attention to-night a few points in regard to modern switchboard design, which effect the safety and reliability, and therefore, the success of modern methods of generating and distributing electrical energy. In a great many cases these points are overlooked by many engineers. I think you will all agree with me that switchboard design and station layout constitute one of the most intricate and important problems which confront electrical engineers.

It has been the custom in laying out stations of moderate size to bunch the conductors from the generators in one duct, or group, and to locate the switchboard and bus-bars in whatever space happens to be available. The feeder cables have usually been run in one well, so close together that a breakdown of one cable has been liable to effect several others. The switches that have been mounted on the switchboard have often not been capable of interrupting the circuits on overloads, and have been sometimes so located in respect to each other that the arc from one would be very

*Abstract of paper read before the Cleveland Electric Club April 3, 1901.

liable to spread and sometimes injure the entire board. The bus-bars have seldom been sufficiently insulated from other parts of the system, and very often a breakdown occurring on one small part has injured them to the extent of causing the entire station to shut down. It is the aim to-day to protect and isolate each part of the switchboard, switching devices, bus-bars and conductors, so as to give the least possible chance for a breakdown under the most severe emergency conditions. Furthermore, if such a breakdown should occur in one part, it would not in any condition spread to another part of the system.

Taking up first the conductors leading from the generating terminals to where they connect with the switching devices, those from each unit should be separated from those of another unit as completely as possible, and should be so protected that a breakdown in one can not involve those of another. This can be accomplished best by running all cables from one unit through a single duct, which may consist of an iron pipe suitably insulated, or a terra-cotta or other fireproof duct. These conductors should be connected to a switching device capable not only of opening the normal load of the generator, but of the short-circuit of the entire station. These switching devices should be so located that in event of failure of any one, it would not disable any other apparatus. In case of extremely large units, it is advisable to provide an extra factor of safety by placing two switches in series, so that in event of the failure of any one, the other will open the circuit. This is analogous to a duplicate system of steam pipes and piping. From the switching device to the bus-bars, the conductors should be protected as far as possible in the same manner as from the generators to the switches. The greatest care should be taken to the location and protection of the bus-bars, as this is the only part of the system where the entire energy is concentrated. Bus-bars should be thoroughly insulated and separated from each other and from other parts of the system, so that in case of a breakdown in any part of the system, it will not be disabled. On high-potential alternating current work, it is desirable to place each bus-bar in its own fireproof compartment, bringing conductors, which connect to it through suitable insulators in one of the walls. For convenience of inspection and repairs, the compartments should be provided with removable flameproof doors. The conductors from the bus-bar to the feeder switches should have the same protection as those from the generator switches to the bus-bars. The feeder switches should be of the same general type as the generator switches, and should be capable of opening under a maximum short-circuit of the entire system. The conductors for the outgoing feeder should be separated as much as possible and grouped in several wells. The number of these wells should be dependent upon the numbers of centers of distribution. There should be, at least, one well for each center of distribution.

The same general rules that apply to switching devices, bus-bars, etc., in the generating station should apply to the sub-stations or centers of distribution. The failure of any part in a single sub-station may cause that sub-station to shut down, but as this is only a single unit of the entire system, it will not have the same effect as a breakdown in any part of the generating station, which is liable to effect the entire system. In some cases it may be possible

to use less expensive switching devices for sub station work.

These problems, however, naturally have to be considered in each individual case. The foregoing may be regarded as axioms upon which all propositions may be developed.

I will now take up and describe, as far as possible, the different methods used to accomplish the desired ends: Starting first with alternating-current stations, of an average capacity of 4,000 kw. to 5,000 kw., operating at a potential of from 6,000 volts to 10,000 volts, three phase. Considering that the safety of the boiler plant, steam pipes, engine and generator units have been thoroughly provided for, we may start with the conductors.

The conductors from the generators should be carried in separate lines of conduit, suitably insulated, to the point where they join their generator switches. The generator switch should be made up of three single-pole elements, each element in its own fire and flameproof compartment. With this construction, if any one pole of a switch should fail, the other two would be capable of interrupting the circuit. Such a switch should, of course, operate as a triple-pole switch, and may or may not be automatic.

There are two styles of switches to-day which are capable of opening high-potential circuits of large magnitude successfully: one is an air type switch, which consists of hinged blades, when opened, the break must be sufficiently long to interrupt the arc. The different poles of this switch must be separated by suitable barriers. The objection to this type of a switch is that it allows the arc to occur in the open air in the station, and to insure safety to other parts of the system, it is necessary to devote to each switch a large amount of space, which, in the power station of to-day is very valuable. The other type of switch, which can be safely used, is the oil switch.

The following is a description of one type of this switch: For each pole there are two stationary contacts, each of which is mounted in an oil receptacle, the moving contact being a "U" shaped piece. This gives two short breaks in series, one break in each oil receptacle, each of the movable contacts being fastened to a cross-bar with insulating material. This cross-bar may be operated in several different manners, two of these methods being sufficiently interesting to warrant a description.

The first is by means of compressed air, the cross-bar being connected to the piston of the air cylinder. The valve admitting the air to the cylinder is controlled by a magnet, which receives its energy from some constant source of power. The only part of the switch which is mounted on the switchboard panels is the small controlling switch, which makes and breaks the connection to the controlling magnet. This is always of small current capacity, and operating at a low potential.

The second method is electrical operation. The cross-head in this case is connected through a crank by a special worm and gear to an electrical motor, this motor being controlled through an operating switch mounted on the switchboard panel similar to the one used for the pneumatically operated switch, the motor deriving its energy from some constant source.

The electrically operated switch has an advantage over the pneumatically operated switch, in that it is unnecessary to install air

compressors, reservoir and piping, which are a constant source of trouble, due to leakage. These oil switches should be mounted in the safest and most convenient position. This location should be such as to give the best and safest layout for the wiring. The conductors from the switches to the bus-bars should preferably be single conductor, rubber-insulated cables, sufficiently separated from each other.

The bus-bars in a plant of this size should be made of bare copper, mounted on porcelain or glass insulators, which will withstand a puncture test of several times the working voltage. Each bar should be mounted in its own compartment. These compartments can be made of soapstone and brick, or any suitable material, and space should be left for a passageway on each side.

The feeder switches should be exactly the same type as the generator switches, except that their ampere capacity will commonly be less. They must be capable of opening the circuit under any condition of load. The feeder switches should be automatic in their operation: that is, they should open automatically on overloads, and it is sometimes desirable to put a time limit attachment on this overload device, so that any short circuit or ground which may occur will have time to burn itself out before the circuit is open. This is especially of advantage in overhead lines which may be accidentally crossed by telephone or telegraph wires.

The greatest amount of care and attention should be given to the station wiring, and the location of the switching device, bus-bars, etc., should be such as to give the safest and most reliable construction. There should be as few crosses as possible, and where such crosses occur, the conductors should be separated by suitable barriers, or a sufficient distance.

Coming now to the operating and instrumental panels: each generator should have connected to it one main ammeter, one main voltmeter, one recording wattmeter, one power factor indicator, one synchronizing device, one field rheostat, one field switch, with discharge resistance, and one operating mechanism for main switch.

The principal point in regard to alternating-current instruments, next to accuracy, is the dead-beat quality. A recording wattmeter on each generator panel is preferable to a single wattmeter in the main bus, as in the first case, the wattmeter is operating nearer its rated load, and therefore with greater accuracy, while, in the second case, as the average load of the station is usually small, as compared to its total capacity, the wattmeter is operating under very poor conditions.

The field rheostat for large generators should preferably be operated by remote control. This can be accomplished in several ways: For example, by mounting the hand wheel on the panel, and the rheostat, where convenient, and connecting the two by a system of beveled gears, or sprocket wheels, and chains: or by mounting the hand wheel on a pedestal placed in front of the switchboard, and connected to the rheostat in the same manner as above; or again, by means of a motor mounted on the rheostat and governed by a controller mounted on the panel. This latter method is preferable, where current in the fields of the generator is of such magnitude that there will be considerable saving of copper by mounting the field rheostat very close to the machine.

The synchronizing device consists of a sys-

tem of connections with potential transformers and a suitable visual indicator. It is usually arranged so as to synchronize between the generators themselves, instead of between the generator and bus-bars, as this is usually the simplest way, especially in the cases where the bus-bar is divided into sections. The synchronizing may be done either by an incandescent lamp connected so as to burn brightly when in synchronism, or by a voltmeter.

The field switch should be of the carbon-break type, so arranged that, at the instant of breaking, a discharge resistance is connected across the field terminals to take up the inductive discharge.

Each outgoing alternating-current feeder panel should have mounted on it three ammeters, the overhead relay and the operating switch for the main switch. The three ammeters are used to show any unbalancing of the three-phase system.

I do not wish to omit speaking of the exciter switchboard in connection with an alternating-current generating station. This board should be so arranged and the location such that it is always convenient to the operator.

Coming now to the switchboards in the sub-stations. As previously stated, the precautions in regard to the safety should be the same as those in the generating stations. There will be slight modifications in regard to

In case of arc service, it has been found advisable to design a special switch, which is of the plug tube type, the arc being ruptured in a long insulated tube. This switch is very satisfactory for small currents upon which it is used, but it would not be recommended for large currents.

One important part of switchboard work which is very often neglected is the use of recording wattmeters. It is of great importance to the station superintendent to have a record of the total watt-hour consumption of power in the various kinds of service of his system. There should be one recording wattmeter on each generator, and one recording wattmeter on each outgoing feeder. In sub-stations of centers of distribution, one wattmeter can be used on each generating unit, and one on each outgoing feeder. It may be advisable in some cases to omit those on the outgoing feeders in the sub-stations.

ELECTRO-MAGNETIC COILS AND PLUNGERS.*

BY RANKIN KENNEDY.

This simple combination, so much used in electrical appliances, has not so far as the author can ascertain, been treated by anyone applying the modern views of magnetism to cre-

$$F = CB \times .00000685.$$

Where r is maximum drag on conductor in pounds per foot of length,
 B = induction in C.G.S. lines per square cm., cutting through the conductors.

In a common arc lamp solenoid B may, and often does, reach a value of 625; calculated by the above formula, this induction would give 0.04 lb. per foot of wire cut in the coil carrying 10 amperes.

A reference to Fig. 1, however, will show that no more than half the coils of wire can be cut by the field when one-half of the coil is filled by the plunger.

Let us consider different cases. Fig. 1 is a case where coil and plunger are equal in length, and we have just glanced at its magnetic condition when the plunger end is half way down the coil. In this position the distribution of the magnetic field is such as shown; one half of the flux cuts one-half of the coil at right angles to the axis, and there can be found a point along the axis of the plunger where the flux is at a maximum in the plunger. This is an important point; it is shown at a b in Fig. 1. It is a little bit below the center of the plunger, so that when half the plunger is in the coil a few of the lines of the field will re-enter, cutting the coil in the reverse direction.

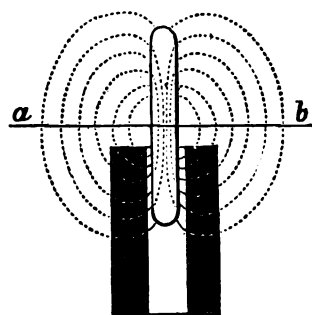


FIG. 1.

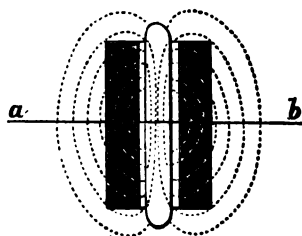


FIG. 2.

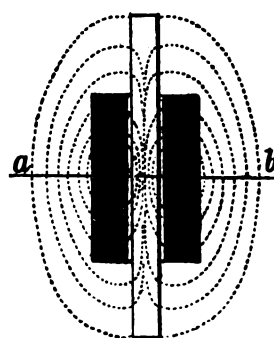


FIG. 3.

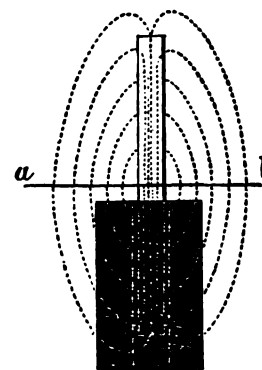


FIG. 4.

details, especially dependent upon the kind of service for which the power is to be used.

The equipment of instruments and other devices on the switchboard for a system will depend upon whether motor generator sets or rotary converters are used. In either case, there should be the same type of switch on the alternating-circuit end as is furnished on the feeders, and it should be capable of opening the circuit under a severe short-circuit.

In the case of the sub-stations being used for direct-current lighting work, the switchboard and switching apparatus will be practically the same as in railway practice, until we come to the direct-current end, and at present, on three-wire direct-current work, each individual case requires its own solution, and it is very hard to lay down any general rules.

If the sub-station is to be used for alternating-current lighting, power is generally distributed by means of step-down transformers, and will be distributed for either incandescent or arc lighting. For incandescent lighting there will be the usual equipment of instruments, and, in the majority of cases, an alternating-current regulator for boosting or lowering the voltage on each individual feeder, so as to keep a constant potential at the lamp terminals. This regulator should be so arranged as to be controlled from the switchboard.

to. Perhaps nothing better is to be found on the subject than Chapter VIII. in the book of Prof. Silvanus Thompson, "The 'Electromagnet,'" but it does not go further than calculating the intensity of magnetic force at any point on the axis of a long solenoid, and some speculative views as to what happens with permanent magnet plungers, long plungers and short plungers, all very interesting from the point of view of the author.

Perhaps the coil and plunger can be best treated as an electro-motor, which indeed it is, even in its most elementary form. Referring to Fig. 1, the coil carries a current of 10 amperes, which acts on the core, producing a magnetic field as shown by the dotted curves. It is evident that the wires or conductors cut the field precisely as do they in a motor, hence the field magnet (the core or plunger) will be drawn in or the coil drawn up, the action and reaction being opposite and equal.

As the plunger of straight bar form is about the worst form of field magnet, even for a simple solenoid, it is difficult to calculate the total flux cutting the coils; but given this total flux or induction, the number of turns cut across, and the current, we can arrive at once at the pull in pounds on the plunger.

The pull on a conductor in the magnetic field of a motor is equal to

*From the "Electrical Review," London.

As the core, or plunger, goes down into the coil, this re-entering of the lines in the reverse direction increases until, when the plunger has reached the far end, as many lines cut the coil going out of one end of the plunger as cut it going in at the other end, so that there can be no pull one way or the other, both fields being equal. This is the case of Fig. 2. The coil lies in two equal and opposite fields of

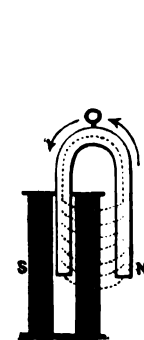


FIG. 5.

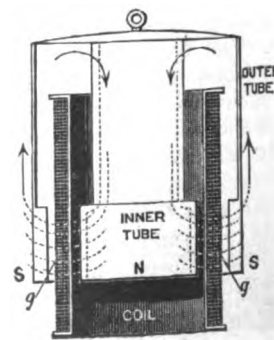


FIG. 6.

magnetic force or lines at right angles to its axis; it is this field at right angles to the axis of the coil which we must deal with in all solenoidal reactions; not the field parallel to the axis.

If the plunger is longer than the coil, it will arrive at a position of equilibrium, with ends

protruding equally, as in Fig. 3. The two fields of force are acting equally on the coil, and if the core is pulled steadily out we will get more and more of the one field removed from it, until a point is reached where the action of the other field is a maximum.

With a straight bar plunger and coil the field is complicated by leakage, the large air-gap allowing the lines to bend round and re-

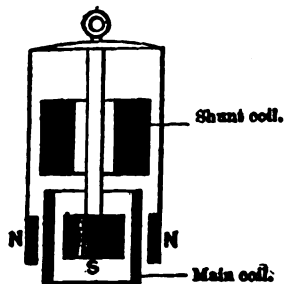


FIG. 7.

enter the core. But if we could measure the induction through the plunger at the point *a b*, Fig. 4, just at the mouth of the coil, we should find this induction a maximum when the pull on the plunger is a maximum. When the pull on the plunger is nil, i.e., when it is in the coil in equilibrium, the line *a b*, i.e., the section of the plunger through which the induction is a maximum, coincides with the middle of the coil, as in Fig. 3. As the plunger is still further pulled out its magnetism falls, and line *a b*, recedes.

In treating of irregular cones and tubes used as plungers, this law that the sectional line of the plunger, where the induction arrives at a maximum, coincides with the middle of the coil, decides the position of the plunger when it comes into equilibrium.

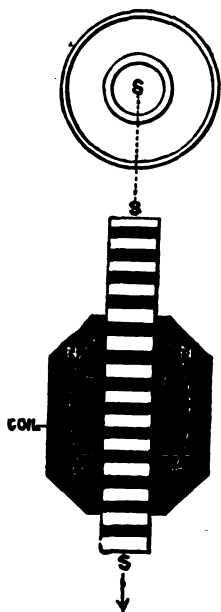


FIG. 8.

Now let us consider a better field magnet for the coil. Let the core be long and bent into a horse-shoe. It is of little practical use considering the position of a core end above the middle of a coil. Fig. 5 shows a coil and horse-shoe plunger. In this case we have the lines of force conducted round the yoke and flowing in one direction only through the sides of the coil; we have done away with one of the fields, and the pull goes on rapidly increasing until the core projects a little beyond the lower end. In some arc lamps each leg of the horse-shoe enters a separate coil.

The induction in the case of a horse-shoe plunger comes within more easily calculable limits. We have, say, for its maximum position, number of turns of wire in the coil $\times$ by amperes flowing $= N C$, and we have the sectional area and length of plungers, also approximate area and length of air-gap, from which we can arrive approximately at the value of the induction in the air-gap. This induction known, the pull can be calculated by the formula already given.

Still, a plain horse-shoe of round or flat iron produces a straggling ill-defined field of force. The polar surfaces are small, but it is a great improvement on the straight bar, where a great pull over a fairly long range is required, with small waste of energy.

Considered from these points of view, the best form of plunger and coil should be designed to make the coil wide and thin, and to use soft iron tubes inside and outside; in fact, a scientific construction of the horse-shoe type of plunger.

Here, in Fig. 6, is a section of a coil, with an inner and outer soft iron tube, connected by a circular yoke, the outer tube forming a mantle over the coil.

We are now coming nearer to a series-wound motor. The wires in the air-gap at *g* are the armature conductors, those above the air-gap the field winding; it is not necessary for me to show how easily the pull on this plunger can be calculated for any position. It may be pointed out that by making the tubes thin

rection of the current in the coil. In Lord Kelvin's recording instruments this coil and plunger is used; it has also been used in an arc lamp.

A very powerful coil and plunger, a modification of the foregoing one, was applied by the author to a machine for striking a heavy blow; it is sketched in Fig. 8. The coil is ironclad, and has two ring-shaped inner poles, *N*, *S*, and a plunger to loosely fit the bore. This plunger has cut into it a series of grooves in which the armature winding is wound, to produce a pole in the middle and one at each end; the length of the core is equal to the length of the ironclad coil plus the length of the stroke. This is a most powerful solenoid and core, or coil and plunger, and may yet be of considerable use in mechanism.

A long solenoid with two long horse-shoe permanent magnets can be used for an equable pull over a considerable range; but permanent magnets are not really permanent when acted upon for any length of time by solenoids.

ENGLISH ELECTRIC MINING MACHINERY.

BY FRANK C. PERKINS.

It may be of interest to note some of the recent types of English mining machinery as installed by the firm of Ernest Scott & Mountain, Ltd., of Newcastle-on-Tyne. The work that has to be done underground in mines and collieries, for which mechanical power is re-

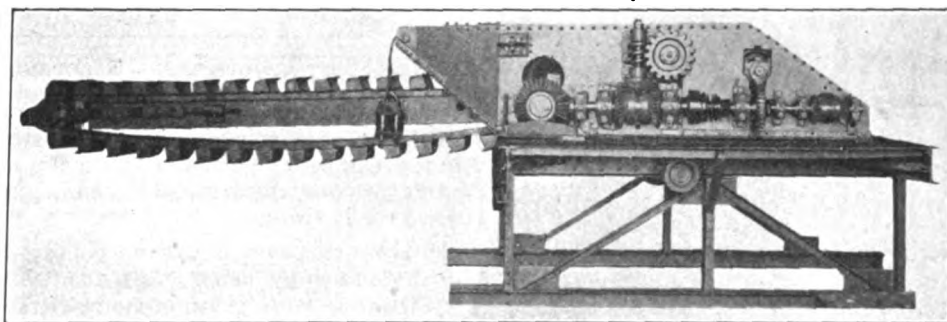


FIG. 1.—ELECTRIC EXCAVATOR USED AT GREAT CENTRAL RAILWAY, LONDON.

enough above their polar faces, they can be saturated magnetically so that the pull will be proportional to the current. This is the beginning of the higher development of the coil and plunger.

If, now, we divide the coil into two coils, one an armature, and the other a field coil, we shall be able to pull the plunger up or down by reversing the current in either half.

A further development arrives at a coil and plunger of the shunt motor type, Fig. 7, a main coil forming the armature and a fine wire shunt coil forming the field winding, together with an outer and inner tube with polar faces.

Here we have a constant field, and the plunger may be driven up or down according to the direction of the currents in the coils.

Another modification of the coil and plunger, which is designed to give a long range of equal pull or push of small force, consists of a long solenoid with a still longer plunger. The plunger carries a magnetizing coil wound in two sections, producing a pole in the middle. The sectional area of the plunger and the power of the magnetizing coil must be so designed that the plunger is magnetically saturated by its own coil. A current in the long solenoid outside will pull with a long equal range, either up or down, according to the di-

quired, consists chiefly of excavating, hauling, pumping, drilling and coal cutting, and for all of these purposes electricity is perfectly adapted to be the motive power. It is essential, however, that all such machinery should be strongly made, to stand the more or less rough usage to which it is sure to be subjected under such unfavorable conditions.

The excavating for the Great Central Railway, London, is an example of the economical and convenient methods in modern construction utilizing electrically operated machinery. The illustration, Fig. 1, shows an electrically operated excavator used in this work, and was designed and built by this firm for use with the Greathead Shield, now extensively used in England and elsewhere in deep tunneling. The materials for construction were carried to the work and the waste excavated matter hauled away by the Scott-Mountain electric locomotive, shown in Fig. 2. These locomotives are equipped with 25 hp. electric motors and are extensively used in mining and contractors' work.

In electric mining pumping two-throw and three-throw ram pumps are extensively used, as the chief condition of success is that the work to be done shall be as steady and continuous as possible, and to secure this the three-throw

pump has been very widely adapted, as giving a constant stream of water, and therefore requiring an even turning moment. In removing water from mines the centrifugal pump direct connected to an electric motor is also found very useful, and is largely used in contractors' work, the sets being mounted on a bogie and lowered to the exact spot where they are required, following the level of the water as it is pumped away. A duplex centrifugal pump will deliver to about 150 feet, while a triplex pump will operate to 200 feet and when four pumps are connected in series will work against 300 feet head.

An electrically driven hydraulic pump of more than passing interest is that shown in the illustration, Fig. 3. It was designed and constructed by Scott & Mountain and is driven direct from an electric motor by means of worm gearing. The most efficient arrangement for electric pumping machinery is by connecting the motor direct to a pump as with centrifugal pumps, or by connecting the motor and driven machine by belt or ropes, but in underground work the latter is often out of the question, on account of the damp atmosphere in which the plant has to work. The two other alternatives are spur or worm gearing, both being positive in their action, and

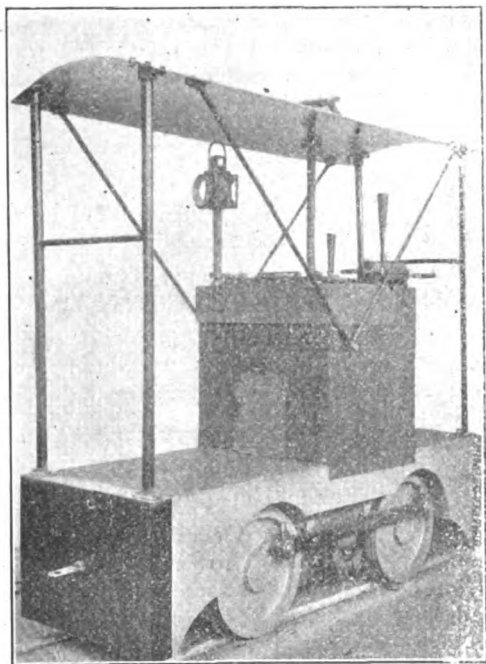


FIG. 2.

Electric Locomotive used in building the Great Central Railway, London.

thus open to the objection that any sudden shock to the driven machine is transmitted direct to the motor, which of course is not the case with belt driven, where a sudden overload causes the belt to slip. A combination of spur gear and belt is sometimes arranged, and works very well for either pumping or haulage. There is considerable loss in a worm gear, but if the worm wheel is machine cut, and the worm runs in a bath of oil, this can be reduced to a minimum and there is no doubt that where space is limited this gear makes a very satisfactory arrangement for reducing the speed of the motor.

In reference to the relative efficiency of electrical power transmission for mining work and other methods, the above mentioned English manufacturers take the following losses for their apparatus, in a plant of say 100 hp., or over:

Loss in dynamo, between horse power on pulley and output at terminals, 7 to 12 per cent.; loss in motor, between watts at terminals and horse power on pulley, 7 to 12 per

There is no gold mine without its full share of unprofitable dirt. There is no course of instruction without its full quota of dry and almost meaningless pages; and there is no

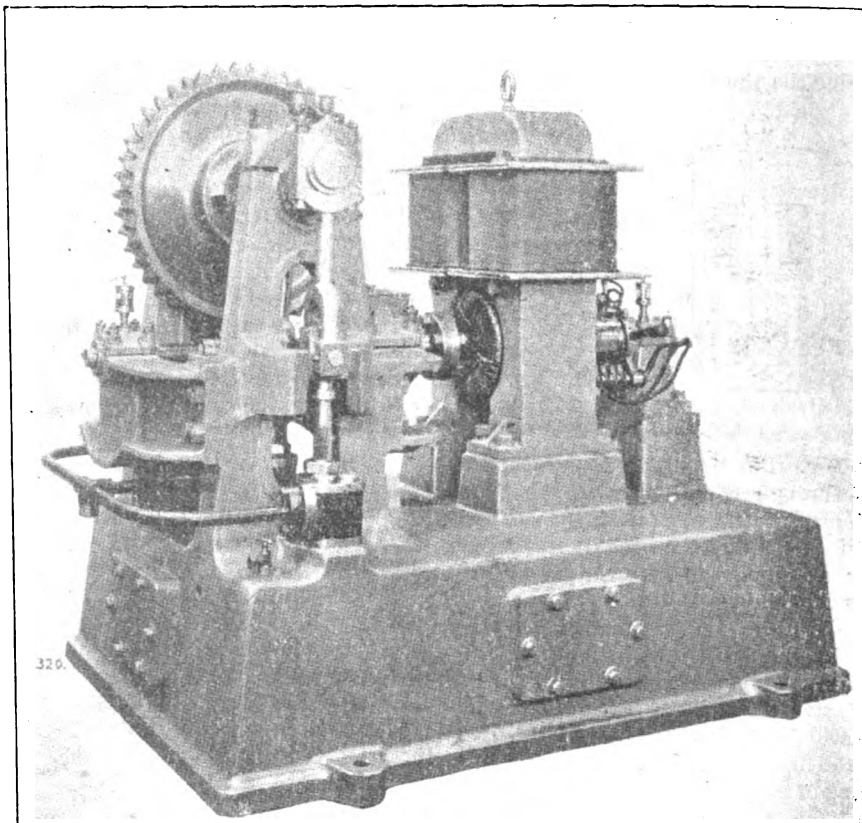


FIG. 3.—SCOTT & MOUNTAIN'S ELECTRICALLY-DRIVEN HYDRAULIC PUMP WITH WORM GEAR.

cent.: loss in cable, 5 per cent., per 100 yards, single run, at 500 volts pressure. The estimate in the instance of generator and motor at 200 yards including the depth of the mining shaft, gives the following results:

Brake horse power on dynamo pulley..	100
Electrical horse power at dynamo....	90
Electrical horse power at motor (loss	
= 4 x 5 per cent. = 2 per cent.)....	88
Brake horse power on motor pulley....	79

or a total efficiency of 79 per cent., which will compare very favorably with any other method of transmission.

It Pays to Read the Trade Papers.

To keep in touch with all the interests of one's business, to know at all times the status of the industry of which one's business is a fraction, to be informed as to wants of buyers and as to the goods of sellers, and to have a knowledge of one's competitors' progress, those are the guide-boards to success of the most elaborate nature. No hermit ever accomplished great deeds. No narrow gauged business man ever became a leader in trade.

Some tradesmen urge the excuse that much that appears in trade journals is neither important nor pertinent, and that their time is so limited and their duties so exacting that they haven't the spare hour in which to read trade publications.

Let us grant, for the sake of argument, the unimportant and irrelevant plea, and ask whether it is better to miss the knowledge of important and pertinent matters because this is so, or to secure the benefits to be obtained from important and pertinent items, even at the expense of reading, in search for the useful, something that isn't so all-important?

road to success without its more than essential rocky steeps and thorny fringe. Just so, there is no trade journal that is all instruction and all rich advice. Were it so, trade journals would sell at a guinea a copy, and trade journal advertising space would be as costly per square inch as £100 bank-notes. Were it so, trade journal editors would rank as twentieth century Solomons, and trade journal publishers would be as unapproachable as the Czar of all the Russians.

As for the item of time, the excuse is no excuse. If you haven't time you should take time, just as you take time for every other business demand. And don't dodge duty by delegating to a clerk the reading of the trade journal. The head of affairs may delegate much labor to assistants, but he cannot delegate brains to any one, and it is brains that count. No two men place the same estimate on the value of any idea, suggestion, or item of news. A paragraph that is trivial to Brown may be a gold mine to Smith and vice versa. And so, if the head of affairs desires to keep in touch with his industry he can ill afford to trust to a clerk's idea of the worth of this or that idea in a trade publication, but instead must read and weigh for himself.—Exchange.

Telephones that Suit the War Department.

The following letter speaks highly for the Ericsson Telephone Company's instruments:

War Department, Signal Office,
Washington, Feb. 26, 1901.

Ericsson Telephone Co., 296 Broadway, New York.

Dear Sirs: Referring to the order this day placed with you for 200 bridging telephones, this office desires to state that, as you are probably aware, in the early part of 1900 we shipped a lot of telephones of six different makes to Manila

for test purposes. The report upon the Ericsson telephone has been favorable. As the telephones covered by the present order are going to Manila, you should understand that it is expected that they will be in every respect of the very highest class of workmanship, in every detail, and it is believed that your company will readily see that it is to your own advantage to turn out the very best instrument possible. The telephones when ready will be subjected to a very careful and thorough inspection.

By direction of the Chief Signal Officer.

Very respectfully.

EUGENE O. FECHET,
Captain and Signal Officer, U. S. V., Disbursing Officer.

LEGAL NOTES.

Judgment for \$17,041 was entered in New York Saturday against the Newburg Electric Railway Company of Newburg, in favor of W. B. Mackay, Jr., on two demand notes of the com-

inventions in connection with the overhead trolley. His health failed in New York in 1894, and he had since resided in Denver.

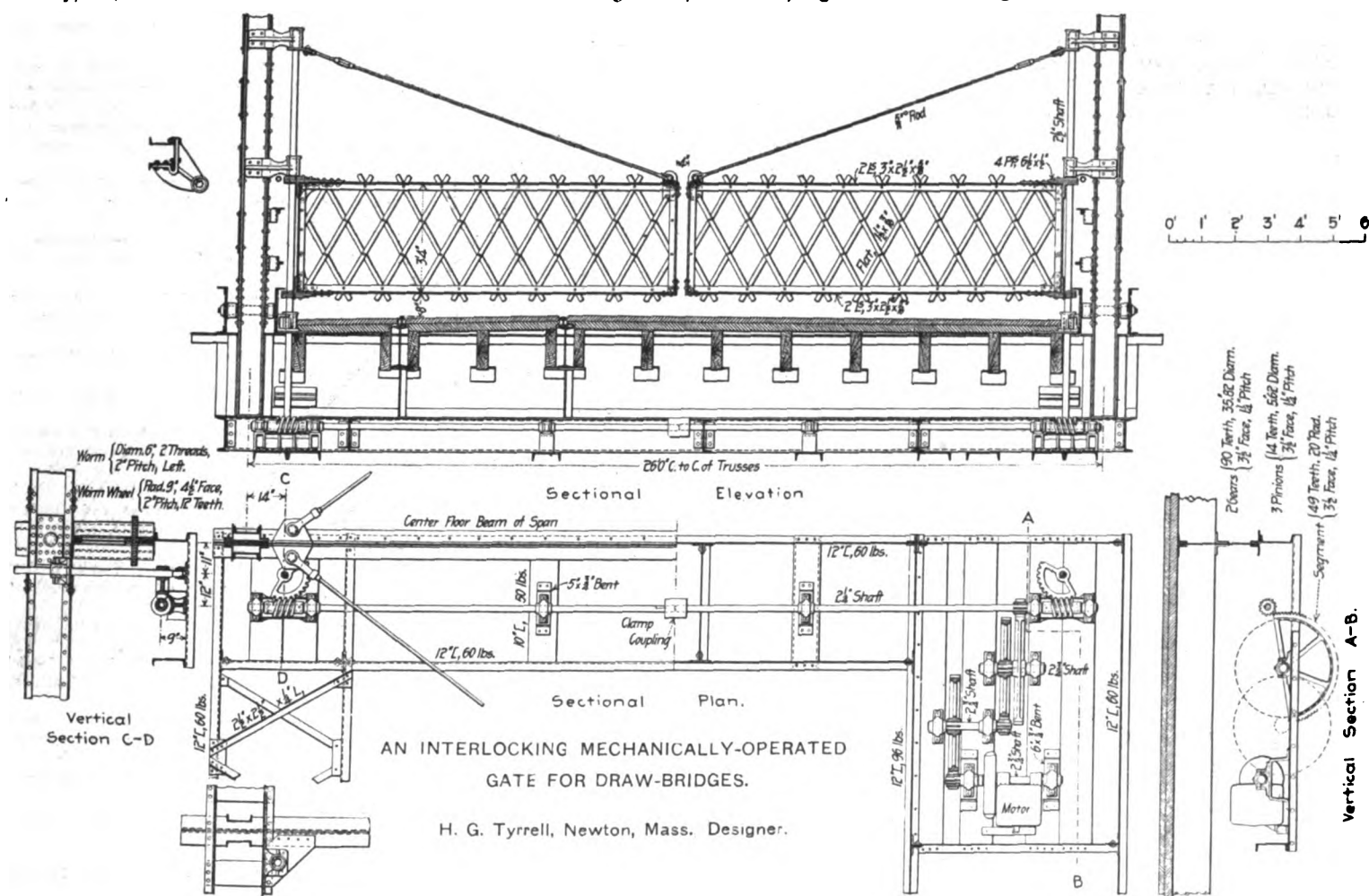
AN INTERLOCKING MECHANICALLY OPERATED DRAWBRIDGE GATE.

BY H. G. TYRRELL, C. E.
Boston, Mass.

The frequency with which serious accidents occur at open drawbridges has prompted the writer to design a mechanically operated gate which he believes to furnish an absolute safeguard against disasters of this sort in all but extraordinary cases. The essential idea of this design is that the bridge and the gate cannot be open at the same time. The first cost of these gates is, of course, high in com-

at the same time gives the operator a few seconds leeway in shutting off his power from the gate motor. Power is supplied by a General Electric 3 hp. inclosed motor, shown in the lower right hand corner of the drawing, and this receives its current from wires on the draw span, through contact plates. When the gates are closed and the draw span is swung open, the electric connection is broken and the gates cannot be moved, hence the gates are controlled entirely by the operator on the draw span. The service of one man only is required on the bridge at any one time.

A bridge equipped with these gates can be opened and closed very quickly, since no time is lost in walking to and from the gates, as in the case of wooden gates operated by hand. The gates are always locked in every position,



AN INTERLOCKING MECHANICALLY-OPERATED
GATE FOR DRAW-BRIDGES.

H. G. Tyrrell, Newton, Mass. Designer.

pany made on November 16, 1898, and April 17, 1899. The summons was served on the president, Silas B. Dutcher, of Brooklyn.

An involuntary petition in bankruptcy has been filed against the Bruckner Electric Company of 141 East 25th street, New York, by creditors. It was alleged that the company is insolvent and permitted Sigmund S. Hershman to obtain a preference by judgment for over \$2,000, on which the sheriff levied upon the assets of the company, and has advertised the sale. It was also alleged that the company had transferred accounts to creditors.

John C. Henry Dead.

John C. Henry, a prominent electrical expert, died Saturday last at his home in Denver, Col., aged 53 years. He perfected many

parisons with the first cost of the ordinary style of hand-operated wooden gates, but they dispense entirely with the services of a gate-man, and for this reason will prove more economical in the long run.

The accompanying drawings show a pair of gates applied to a bridge with approach spans at either end, and having a 26 ft. roadway and no sidewalks. The design can, however, be modified to suit any width of bridge, either with or without sidewalks. As will be seen the gates are keyed to vertical shafts, which are shown turning in boxes fastened to the web posts of the fixed span. At the foot of these shafts are toothed segments worked by worms, which lock the gates in any position. These worms turn in oil baths, as shown. The worm shaft is connected by a system of reducing gears with the motor. In this system of gears is included a half-gear, which insures a movement of 90° only to the gates and

either open or closed. As an extra precaution they may be placed say 100 feet from the draw span. Then, should a car or train break through them, it would certainly come to a standstill before reaching open water. As a further precaution a derailing switch may be placed inside the gates, then in case of a car breaking through the gate, it would be thrown from the track and stopped, rather than pitching over the end of bridge. This switch may be operated by the gate motor through a series of wheels and levers.

At all times of both day and night the roadway should be well lighted and the gates themselves painted white so that they may be more easily seen. Danger lights should be located on the gates, showing white when open and red when closed. It is desirable to have these located sufficiently high above the floor that they may be plainly seen above a crowd. An estimate, based on the accompanying plan,

and including both ends of the bridge, is as follows:

Weight of gates.....	2,100 lbs.
" " machinery.....	5,600 "
" " machinery support...	5,200 "
	12,900 lbs.
12,900 lbs at 5 cents.....	\$645.00
Two motors, 3 hp.....	300.00
Total cost.....	\$945.00

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended April 25:

Aberdeen, 3 packages, \$300; 13 cases, \$2,021; Antwerp, 96 packages, \$7,965; Argentine Republic, 2 packages, \$66; Australia, 292 packages, \$21,603; 52 cases, \$2,053; Berlin, 1 case, \$199; Brazil, 216 packages, \$14,141; British East Indies, 15 cases, \$500; 6 packages, \$945; British Guiana, 1 package, \$13; British Possessions in Africa, 95 packages, \$7,059; British West Indies, 11 packages, \$136; Brussels, 2 packages, \$184; Central America, 22 cases, \$663; 92 packages, \$3,632; Copenhagen, 10 cases, \$462; Cuba, 43 cases, \$1,379; 10 packages, \$555; Dutch West Indies, 2 packages, \$32; Florence, 27 packages, \$5,065; Genoa, 1 package, \$145; Gibraltar, 13 packages, \$750; Gijon, 2 cases, \$81; Glasgow, 67 packages, \$9,541; 11 cases, \$130; Havre, 38 packages, \$2,630; Hayti, 1 case, \$40; Lisbon, 2 cases, \$14; 1 case telephone material, \$66; 3 coils cable, \$2,890; Liverpool, 324 packages, \$101,805; London, 265 packages, \$16,374; 1 case motor vehicles, \$148; Manchester, 1 package, \$30; 229 cases, \$27,645; 19 packages motor vehicle parts, \$2,200; Marseilles, 27 cases, \$904; Mexico, 65 cases, \$6,159; 9 reels cable, \$3,803; Milan, 6 cases, \$3,000; New Castle, 6 cases, \$500; New Zealand, 65 packages, \$4,422; Peru, \$267 cases, \$19,105; Preston, 2 cases, \$100; Southampton, 1 case motor vehicles, \$25; 16 packages, \$1,062; Tasmania, 39 packages, \$1,120; U. S. Colombia, 33 cases, \$415; Venezuela, 52 packages, \$790; Vienna, 4 packages, \$343.

The following are the exports of electrical material, from the port of New York, for the week ended May 2:

Aberdeen, 27 cases, \$350; Antwerp, 16 packages, \$645; Argentine Republic, 175 cases, \$6,224; 16 packages, \$1,632; Australia, 2 cases, \$145; 2 packages, \$15; Bergen, 1 case, \$15; Birkenhead, 159 packages motor trucks, \$3,475; Brazil, 245 packages, \$16,807; Bremen, 21 packages, \$665; British Guiana, 23 packages, \$530; British Possessions in Africa, 3 cases, \$255; 1 case motor vehicles, \$1,725; British East Indies, 2 cases, \$232; British West Indies, 45 packages, \$1,265; Central America, 70 cases, \$932; Chili, 4 cases, \$484; Christianity, 1 case, \$150; Cuba, 218 cases, \$2,177; Dutch East Indies, 1 case, \$95; Ecuador, 15 cases, \$293; Genoa, 70 packages, \$5,066; Glasgow, 31 cases, \$5,041; 8 electric launches, \$6,400; 38 reels cable, \$11,659; Hamburg, 78 packages, \$9,460; 1 auto vehicle and parts, \$200; Havre, 19 packages, \$911; 236 cases, \$30,323; Hayti, 1 case, \$60; Hull, 55 packages, \$2,750; Libau, 3 cases, \$500; Liverpool, 175 packages, \$19,253; London, 625 packages, \$35,224; Madrid, 11 cases, \$900; Manchester, 18 packages motor trucks, \$2,400; Marseilles, 1 case, 40; Mexico, 166 packages, \$2,191; Middlesborough, 2 cases, 139; Milan, 7 cases, \$280; Naples, 1 case, \$5; Newcastle, 1

case, \$24; 12 packages, \$3,900; New Foundland, 5 packages, \$174; Nova Scotia, 8 cases, \$1,125; 2 bags, \$11; Peru, 14 packages, \$903; Port Said, 2 packages, \$26; Portsmouth, 1 case, \$300; Preston, 15 packages, \$525; Santo Domingo, 28 packages, \$554; Sheffield, 1 case, \$111; Southampton, 15 packages, \$1,230; 1 case, \$313; Stockton, 10 cases motor trucks, \$1,220; U. S. Colombia, 30 cases, \$1,218; Venezuela, 8 packages, \$161; Vienna, 3 cases, \$366.

PERSONAL MENTION.

Mr. Louis Glass of San Francisco, Cal., has been appointed general manager of the Pacific States Telephone & Telegraph Company.

INCORPORATIONS.

The New Electric Company, Niles, O. Capital stock, \$25,000.

The General Engineering Company, Brooklyn, N. Y.—to construct, maintain and operate gas and electric works. Capital stock, \$250,000.

The Carthage Electric Light & Power Company, Carthage, N. Y. Capital stock, \$75,000. Directors: J. E. Strickland and P. J. Corcoran, Carthage; T. B. Basselin, Croghan.

The Lake Placid Electric Light Company, Lake Placid, N. Y. Capital stock, \$10,000. Directors: Melville Dewey, Annie Dewey and Asa O. Gallup of New York City.

The Century Electric Company, San Francisco, Cal. Capital stock, \$40,000. Directors: L. D. Heltzer, S. H. Weidenthal, W. J. Nixon, F. H. Bates and W. D. Mackey.

The National Electric Improvement Company, Jersey City, N. J. Capital stock, \$2,000. Incorporators: Stephen C. Smith, Le Grand Bouker, Jersey City.

The M. K. C. Electrical Separator Company, Denver, Col.—to operate in Arapahoe County. Capital stock, \$100,000. Incorporators: F. H. Kirby, J. M. McClave, F. R. Cumbe and William Colley.

The Collins Electric Company, St. Louis, Mo. Capital stock, \$100,000. Incorporators: William F. Kempner, Ulysses L. Collins, F. William Grundman and William S. Cowan.

The Essex Electric Company, Trenton, N. J. Capital stock, \$700,000. Incorporators: W. Campbell Clark, Franklin Conklin, Henry Dickson, Bernard Strauss, Jacob Hausling, Richard C. Jenkinson, Julius H. Lebkuecher, Simon Scheuer, Robert H. McCarter, Moses Straus and J. Broadhead Woolsey.

The American Light Company, Philadelphia, Pa.—to manufacture and buy and sell all kinds of machines for distributing gas and electricity. Capital stock, \$5,000,000. Incorporators: J. Emory Bryan, M. C. Reed and A. D. Phillips of Philadelphia.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED APRIL 30, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

673,176. Clamp for Trolley Wires. James W. Perry, Philadelphia, Pa., assignor to H. W. Johns Manufacturing Company of New Jersey. Filed March 28, 1901.

673,186. Means for Retracting Trolleys. Thomas J. White, St. Louis, Mo. Filed Dec. 28, 1900.

673,209. Brake. Frank J. Jüngemann, Detroit, Mich. Filed July 18, 1900.

673,319. Double-Relay Crossing-Signal. Bert N. Parrish, Jackson, Mich. Filed June 30, 1900.

673,286. Electromechanical Emergency-Brake for Trams. Emanuel von Planta, Lucerne, Switzerland, assignor to the Gesellschaft für Patentverwertung der Elektro-Mechanischen Notbremse (System Planta), Basle, Switzerland. Filed Jan. 10, 1901.

673,368. Trolley-Stand. Frank Pfent, Conners Creek, Mich., assignor of one-half to Gilbert M. Moran, Detroit, and Louis A. Moran, Grosse Point, Mich. Filed June 27, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

673,999. Anchor for Electric-Lamp Glowers. Marshall W. Hanks, Pittsburg, Pa., assignor to George Westinghouse, same place. Filed June 16, 1899.

673,106. Electric-Arc Lamp. Samuel H. Anderson, Pasadena, Cal. Filed May 23, 1900.

673,191. Device for Attaching or Detaching Electric Lamps. David H. Arthur, Philadelphia, Pa. Filed Dec. 27, 1897.

673,277. Incandescent Electric Lamp. Jules E. de Marcay, Paris, France. Filed Nov. 8, 1898.

ELECTRICAL MACHINERY AND APPARATUS.

672,950. Electric Motor. Frank A. Merrick and Joseph D. Forrer, Johnstown, Pa., assignors to the Lorain Steel Company of Pennsylvania. Filed Aug. 16, 1900.

672,951-672,952. Electric Railway-Motor. Frank A. Merrick, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Aug. 21, 1900.

672,989. Transformer. Harry Shoemaker, Philadelphia, Pa., assignor of one-half to Gustave P. Gehring, same place. Filed Feb. 12, 1901.

672,992. Controller for Electric Motors. Emmett W. Stull, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Original application filed June 8, 1900. Divided and this application filed July 25, 1900.

673,085. Safety-Synchronizer for Coupling into Parallel Alternating-Current Machines. John Pearson, St. Paul, Minn. Filed Feb. 19, 1901.

673,108. Rheostat. Arthur W. Beresford, Westfield, N. J. Filed June 12, 1900.

673,274. Electric-Circuit Controller. Harry W. Leonard, New York City. Filed March 27, 1899.

673,317. Automatic Reverse Cut-Out for Electric Traveling and Hoisting Cranes. Jacob S. Cole and George F. Swartz, Homestead, Pa. Filed Aug. 14, 1900.

673,372. Voltage Regulator. Phil S. Tirrill, Groveton, N. H., assignor of one-half to Charles E. Bellows, same place. Filed June 27, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

672,942. System of Automatic Telephone-Exchange. Alexander E. Keith, John Erickson and Charles J. Erickson, Chicago, Ill., assignors, by means assignments, to the Automatic Telephone Exchange Company, Limited, Baltimore, Md. Filed June 23, 1897.

672,947. Telephone-Exchange Mechanism. Harlan P. Snow, Erie, Pa., assignor of one-half to Frederick C. Jarecki, same place. Filed Sept. 28, 1899.

672,999. Telephone System and Apparatus Therefor. Arthur T. M. Thomson, East Dulwich, Eng. Filed Oct. 9, 1899.

673,072. Telephone-Meter. Donald M. Bliss, Lowell, Mass., assignor to the Automatic Telephone Meter Company, Orange, N. J. Filed Oct. 1, 1900.

673,311. Telephone Appliance. Myer London, McKeesport, Pa. Filed Oct. 31, 1900.

673,344. Telephone Switch and Cut-Out. Peter J. Wendell, Ophelm, Ill. Filed April 18, 1900.

673,350. Telephone-Transmitter. Charlton E. Yocom, New York City, assignor of one-half to James G. McFadyen, Pittsburg, Pa. Filed Feb. 4, 1901.

MISCELLANEOUS.

672,913. Electrolytic Current Rectifier and Condenser. Charles Pollak, Frankfurt-on-the-Main, Germany. Filed March 7, 1899.

672,936. Control of Electric Motors. Frank W. Garret, Johnstown, Pa., assignor to the Lorain Steel Company, of Pennsylvania. Filed Aug. 28, 1900.

672,959. Electrical Connector. Harry E. Norris, Northeast, Pa. Filed July 20, 1900.

673,020. Electric Pendulum Clock. Frederick Haenichen and Otto A. Haenichen, Paterson, N. J. Filed Jan. 10, 1901.

673,169. Electric Elevator. Nils O. Lindstrom, New York City, assignor to Alonzo B. See and Walter H. Tyler, same place. Filed Feb. 4, 1901.

673,172. Magnetic Separator. Robert McKnight, New York City. Filed March 15, 1900.

673,222. Storage Battery. Arvid Reuterdaahl, Providence, R. I., assignor to Reuterdaahl Electric Company, Saco, Me. Filed Aug. 9, 1900.

673,288. Electric Signal. Hiram M. Buck and John H. Love, Baltimore, Md. Filed June 11, 1900.

673,289. Regulation and Control of Electric Motors. James Burke, New York City, assignor, by means assignments, to H. Ward Leonard, same place. Filed March 22, 1898.

673,249. Base for Battery Cells. George T. Eyanon and Albert J. Shinn, Philadelphia, Pa., assignors to Herman J. Dercum, trustee, same place. Filed Dec. 4, 1900.

673,266. Booster-Regulating System for Storage-Battery Circuits. Albert S. Hubbard, Belleville, N. J., assignor to the Gould Storage Battery Company, New York City. Filed March 2, 1901.

673,287. Storage Battery. Arvid Reuterdaahl, Providence, R. I. Filed Oct. 10, 1900.

673,289. Supporting-Frame for Relay-Magnets. Ulysses G. Rogers, New York City. Filed Feb. 28, 1901.

673,315. Printing Telegraph. George A. Cardwell, New York City, assignor to Joseph Heimerdinger, trustee, same place. Filed Nov. 18, 1899. Renewed Nov. 14, 1900.

673,345. Regulation of Dynamo-Electrical Machinery. Schuyler S. Wheeler, New York City, assignor to Harry Ward Leonard, East Orange, N. J. Filed Sept. 24, 1894.

673,348. Electrical Distribution. Joseph L. Woodbridge, Philadelphia, Pa., assignor to the Electric Storage Battery Company, same place. Filed March 13, 1901.

DESIGN.

34,451. Trolley-Harp. Fredrick Sarbach, Westpark, O. Filed April 1, 1901. Term of patent 14 years.

THE TELEPHONE WORLD.

Detroit to Have a Model Exchange

The People's Telephone Company of Detroit, Mich., has let contracts for the construction of its telephone exchange system and contemplates the erection and equipment of the largest single multiple switchboard and central office equipment ever installed in the United States. This contract was awarded to the Stromberg-Carlson Telephone Manufacturing Company of Chicago after a thorough investigation of the various apparatus manufactured.

The initial switchboard equipment calls for a switchboard to have a capacity for 14,400 subscribers' lines of the multiple lamp line signal central energy type, equipped for the immediate operation of 6,000 subscribers' lines, with complete power, battery and ringing equipment in duplicate, with a capacity sufficient for the complete operation of the full ultimate capacity of the switchboard, and 6,000 telephones.

Manager J. B. Ware considers the Stromberg-Carlson system the best on the market to-day, and it is said that the bid of this company was the highest received by the People's Company; that superiority determined the award.

The Stromberg-Carlson system is already in use in Rochester, N. Y., St. Paul and Minneapolis, Minn.; Boston, Mass.; Youngstown and Akron, O.; Camden, N. J.; Duluth, Minn.; Waco and San Antonio, Tex.; Lexington, Ky.; Wheeling, W. Va., and a great many other smaller cities in the United States.

"We placed our order just in time," said Mr. Ware, "to get in ahead of Philadelphia and other Eastern and Southern cities where new telephone companies are figuring with the Stromberg-Carlson people. In fact, we hurried our order to be sure of having our work done first."

The installation date specified in the contract is February 1, 1902.

The People's Telephone Company, after a careful search for adequate headquarters, decided that it could only obtain what it wished by buying a site and erecting an exchange building, and accordingly purchased a lot 80 x 90 feet located on the southwest corner of Park and Elizabeth streets. The company's engineers have figured out that this site is within 200 feet of the telephone center of the city. The building will be six stories in height, modern in construction and especially designed for use as a telephone exchange. The building is favorably situated so that it will receive light from the north and east sides and afford excellent opportunities of bringing the very large and complex conduit system into the building without conflict with the existing conduit systems of other companies. The engineering problem for the installation of such a large system has been very creditably worked out by its consulting engineer, Mr. M. Reber, of Cleveland, O., who has had a great deal of experience in the construction and operation of some of the largest exchanges in the United States.

The underground material will be supplied by the Standard Underground Cable Company of Pittsburgh, one of the two largest houses in the United States dealing in this line of material. The contract was made at a certain price per foot, the material to be delivered as called for. The work of underground construction will be commenced at once.

The contracts for other materials have not yet been awarded, "but these can be obtained in the market at almost any time," says Mr. Ware, "the chief idea being to get contracts placed on the work that requires time. It has fully been determined that only copper wire shall be used, making the entire Detroit system one of metallic circuit."

"We recognize that business demands make the question of service the vital and final one in the telephone field, and especially is this true in Detroit, inasmuch as there had been one independent telephone exchange here which, owing to various causes, did not adequately meet the requirements," said Mr. Ware, "and this is the one point we have in view in constructing this system. The People's Telephone Company's Detroit exchange will be the model exchange of the United States. It is to accomplish this that it has decided upon the Stromberg-Carlson switchboard and telephones, to install an all copper wire service and to concentrate all our lines in one big exchange building. In this concentration of lines alone we shall be able to save time for our subscribers and largely increase the efficiency of the service. We do not believe at all in the branch station system. The Stromberg-Carlson Telephone Manufacturing Company will endeavor to make this Detroit exchange the model exchange of the United States for the reason that the city of Detroit is central and has many visitors and will be a show room for them, so to speak. Everything about the construction will be permanent and with a view to the accommodation in the not distant future of the entire 14,400 subscribers' lines, for which the exchange is being built and designed to accommodate."

Plans of a telephone line from Baker City, Ore., to the Panhandle are under consideration.

Messrs. Stone & Webster's report on Erie Telephone properties, says a large part of the construction has been done in the past two or three years, and the lines as a whole are comparatively new. The underground system is in use in business sections in all of the larger cities. About 40 per cent. of the total subscribers are served through underground cable, which contains 48 per cent. of the total exchange wire mileage. The average amount of wire mileage underground in the Bell system is 52 per cent. Considering the Erie Company has only six cities of the 32 in the United States with a population of 75,000 or more, the proportion of underground wire is very satisfactory. The Erie companies own and occupy 51 buildings and 14 parcels of land. The cost to reproduce property, exclusive of cost of franchises and rights of way, is placed at \$26,300,000.

As a result of the franchise granted the Northwestern Telephone Company by the Vermillion, S. D., city council Superintendent Christy has ordered numerous improvements to be made. New poles will be placed in position, all old 'phones will be replaced by new ones, two new switchboards, one for toll and the other for the local exchange, will be added. Twelve hundred feet of new cable has reached Vermillion, and the work of remodeling has started. Over 100 'phones are now in use in Vermillion.

The stockholders of the Spottsylvania, Va., Telephone Company, after declaring a dividend of 25 per cent. on the stock decided to extend the line to Belmont and Chilesburg in that State. At Belmont connection will be had with the Louisa line, affording communication with Richmond, Charlottesville and other cities.

The company which contemplates the construction of a telephone line from Tampa to Jacksonville, Fla., will commence operations very soon. The route has been laid out, and much of the right of way and certain franchises secured. The Orlando system will act as a feeder and lines will be built to the principal points near that city.

R. E. McWilliams is busy putting in a telephone system that will connect Canton Bend and Rock West with Camden, Ala., and it is not improbable that in the near future he will extend his lines to more distant points in Wilcox County. This new enterprise will prove a great convenience both to Camden and the surrounding towns.

The Kanton, O., Telephone Company is extending its lines all over the eastern part of Hardin County. A number of the farmers have had telephone service for the past few months, and on account of the satisfaction given, the county will be a network of rural lines before the close of the year.

Warren and Youngstown, O., capitalists, who now own the independent telephone system at Seattle, Wash., will organize a company with \$500,000 capital to buy the independent system at Portland, Ore. The same company owns the Birmingham, Ala., plant.

F. C. Pasak is to have charge of the installation of the plant of the Automatic Telephone Company in Seattle, Wash. Mr. Pasak says that by June 27, 360 telephones will be in operation. Underground cables will be laid throughout the business part of that city.

The Citizens' Telephone Company of Harriman, Tenn., has changed its name to the Tennessee Telephone Company. The charter has been secured and the capital stock placed at \$10,000. Aggressive steps are being taken to perfect the system and get ready for service at an early day.

J. W. Barwick and other representatives of the Peninsular Telephone Company have been granted a franchise by the Palmetto, Fla., city council. They agree to complete a long distance telephone line to Tampa by October 15.

The Commercial Telephone Company is preparing to make further extensions of its line to Jersey Shore, Pa. It also expects to get into Beech Creek shortly.

The State of Texas has granted a charter to A. M. Beville, J. M. Clower, J. D. Stacking and R. W. Talley to establish and operate a telephone system in Clarendon.

There is some talk of running a local telephone line from Marengo, Ill., north about two miles, thence west of the river road some four miles to the "seven bridges."

It is proposed to connect Monticello and White Lake, N.Y., by telephone. Already the necessary subscribers have been secured and operations will be commenced immediately.

S. P. Sheerin, of the New Long Distance Company of Indianapolis, says: "Telephones and telephone service are spreading over Indiana as rapidly as workmen can erect the plants. Within the last six years telephones in Indiana have increased from 12,000 to 66,000. The development of the independent companies and their friendly co-operation have been the most remarkable in modern history, and this development and the investment of large sums of money have been accomplished in spite of strong opposition and legal complications. The barbed-wire farm service has given way to substantial lines, and good service among the farmers is about as common as in the cities. Our line is now connected with nearly 30,000 telephones, and by reason of contracts with other independent companies we are connected with upward of 50,000 telephones. The future is full of promise, and henceforth the battle will be an even contest."

The committee on banking and commerce of the Dominion Senate has reported the bill increasing the capital stock of the Bell Telephone Company from \$5,000,000 to \$10,000,000. The company has thus won out against all opposition. The proposal to restrict the rates the company may charge to such rates as were in existence in 1892, when the company got its original increase of capital stock, and the proposal also of making the company liable for any over-charges since that time, were rejected. The company, however, accepted part of the amendment compelling it to furnish telephones upon application from persons living adjacent to the telephone system. The company was ordered to produce a list of its shareholders before the bill was further proceeded with.

On May 3 the State Board of Taxation rendered a compromise judgment in the case of the appeal of the New York & New Jersey Telephone Company from the assessment placed on its properties in Newark, N. J., by the local tax board. The company had been assessed \$350,000 on its personal holdings and \$160,000 on its buildings. By an agreement with City Attorney Boggs the company had agreed to abandon its appeal providing the personal assessment was reduced \$50,000.

The Mount Calm, Tex., city council has granted a franchise for the erection of a local telephone exchange and it will be put in as soon as the material can be secured. It will be operated by Mr. McFarlane, proprietor of the telephone system at Hubbard.

J. W. Morton, Secretary of State, recently issued a charter to the People's Telephone Company of Stewart County, Tenn. The capital stock is \$3,000, and the incorporators are: W. T. Thomas, R. G. McFall, W. B. Scott, C. C. Lewis, W. O. Edwards, George Stacker and R. E. Thomas.

The system of the Central Telephone Company, which has headquarters in Des Moines, Ia., has been sold to Indiana men for \$19,000. It is understood that from \$20,000 to \$25,000 will be expended at once in improvements.

TELEPHONE INCORPORATIONS.

The Henry County Home Telephone Company, Columbus, O. Capital stock, \$50,000.

The Ava Mutual Telephone Company, Avon, Ill. Capital stock, \$1,500. Incorporators: George E. McFarland, A. Sundberg and G. S. Osborn.

The Milo & Bradford Telephone Company, Milo, Ill. Capital stock, \$5,000. Incorporators: John McClane, Leroy H. Reed and Harmon S. Pettigrew.

The Independent Telephone Construction Company, Chicago. Capital stock, \$2,500. Incorporators: James P. Harold, W. E. Caylor and others.

The Southern Central Telephone Company, Trenton, N. J. Capital stock, \$10,000,000. Incorporators: John W. Avery, Osborn Congleton and Horace E. C. Thompson of New York.

The Spencerville Telephone Company, Spencerville, O. Capital stock, \$20,000. Incorporators: Albert C. Buss, Henry M. Ashton, S. L. Ashton, Ira B. Post and Philip Zimmerman.

The Walnut Hill Telephone Company, Walnut Hill, Ark. Capital stock, \$2,500. Officers: J. F. McKnight, president; S. Hacker, vice-president; D. D. Hamiter, secretary and treasurer.

The Charlottesville Rural Telephone Company, Charlottesville, Ind. Capital stock, \$200. Directors: Robert S. N. Oldham, Daniel Pearson, David Bundy, James McClarnon and others.

The Albany Home Telephone Company, Albany, N. Y.—to operate a telephone system in Albany and Rensselaer Counties. Capital stock, \$750,000. Directors: Samuel B. Rawson, F. H. Sudro, T. M. Brush, F. W. Martin, I. H. Griswold, A. E. Lord, of Elyria, O.; G. O. Lee, Jr., Howard Hendrickson and W. H. Keller of Albany.

GENERAL ELECTRICAL NEWS.

Lighting.

Bangor, Me.—Hon. J. P. Bass of this city has purchased the plant of the Oldtown Electric Light Company and will enlarge it this spring.

Benwood, W. Va.—The Wheeling Steel & Iron Company will install an electric light and power plant.

Berryville, Ark.—The Berryville Milling Company will in the near future install an electric light plant.

Caldwell, N. Y.—In a short time the streets of this place will be lighted by electricity.

Chatham, N. J.—A special election for the purpose of voting on the bonding of this borough for \$15,000 to establish an electric light plant will be held on May 14.

Clarksdale, Miss.—This city has decided to build an electric lighting plant. J. A. Omberg of Memphis, Tenn., has prepared the plans and specifications, and bids will be called for. W. Barry is chairman of the committee.

Dayton, O.—A bond issue to the amount of \$500,000 will be made soon by the Dayton Electric Light Company to provide for improvements to its plant.

Elgin, Tex.—This place will soon have electric lights; Messrs. J. M. M. Millan and S. H. Spangle, two capitalists of Taylor, have been investigating the matter.

Estherville, Ia.—Arrangements have been completed by the city for the enlargement and improvement of its electric light plant.

Geneva, O.—The citizens will vote on the question of issuing \$25,000 in bonds for the purpose of installing an electric light plant with municipal ownership.

Grant City, Ia.—This city is to have an electric light plant.

Holgate, O.—The city council is discussing the electric light question.

Hyalman, Pa.—This place is to have a new electric light plant.

Kenton, O.—The plant of the Kenton Gas & Electric Company has been sold to Samuel R. Bullock of New York. The company is capitalized at \$200,000, and has a five-year contract to light the city with electricity.

Laurel, Del.—Philadelphia and Wilmington capitalists have leased ground of Dr. Wolfe at this place, and will erect an electric light plant at once for the purpose of lighting Laurel, Seaford and other towns.

Lawrenceburg, Ind.—Bids will soon be advertised for the erection of an electric light plant in this place.

Lewes, Del.—The citizens of this place have voted to bond the town in order to establish an electric light plant.

Lisbon, Me.—The people here are agitating the question of establishing an electric street lighting plant.

Livermore, Pa.—Messrs. Smith & Miller of Johnstown have in view the operation of an electric light plant here in connection with the mill they purchased recently.

Manchester, Mich.—Manchester is dissatisfied with the present lighting service, and the village may purchase and enlarge the present plant when the franchise runs out.

Manning, S. C.—Dr. A. Becker contemplates the erection of an electric light plant here.

Middleville, Mich.—A stock company has been formed to operate an electric plant at Labarge, which will furnish power for this place and other towns in Barry County, some of which have already granted the company franchises to string its wires.

Monroe, La.—The Ouachita Cotton Mills will contract for an electric lighting plant.

Monroeville, Ind.—The Monroeville Electric Light Company was lately incorporated for \$10,000 by C. F. Manship, T. Noble and J. M. Tryon.

New Bloomfield, Pa.—This place is negotiating for an electric lighting and heating plant.

New Hartford, N. Y.—The Utica Electric Light & Power Company will install an electric light plant here.

Orrick, Mo.—The citizens of this place are talking of erecting an electric light plant.

Park River, N. D.—The citizens of this place will vote on the question of bonding for a municipal electric light plant and waterworks.

Sebewaing, Mich.—An electric lighting plant will soon be erected here.

Starke, Fla.—This city will issue \$13,000 of bonds for the erection of an electric light plant.

St. Michael's Md.—A number of business men have organized a company for the purpose of manufacturing ice here during the summer. A strong effort is also being made to establish an electric light plant, the same machinery to operate both the ice and electric light plant.

Summitville, Ind.—This place will soon have an electric light plant.

Troy, N. Y.—Messrs. Cordial, Hart and Moulton have been appointed a special committee to consider the expense and advisability of establishing a county electric lighting plant.

Tullahoma, Tenn.—This city has named F. B. Martin, W. M. Ross and E. L. Davis commissioners to provide for the erection of a municipal electric light plant.

Street Railways.

Bristol, Tenn.—The Belt Line Railway, which operates a power plant is taking steps to add electric light dynamos to its plant.

Chicago.—A company has been incorporated in Illinois to build an electric railroad from here to St. Joseph, Mich., a distance of 90 miles. This road will traverse the Michigan fruit belt and it will be the longest electric line in the West. Its estimated cost is \$2,000,000. The incorporators are H. T. Clark and J. T. Barhoff, of Cleveland, and W. F. Lesser of St. Joseph, Mich.

Cleveland, O.—The Cleveland, Painesville & Ashtabula Railway Company, which will build an electric line from Painesville to Meadville will be incorporated with \$1,000,000 capital stock.

Cornwall, Ont.—The Cornwall Electric Street Railway Company has purchased the property of the Cornwall Milling Company, which includes a large water-power, that it will use for operating its line.

Des Moines, Ia.—A special election will be held in Winterset May 21 to vote on the proposition to grant a franchise to H. H. Polk of this city for an interurban electric line between Winterset and Des Moines.

Hornellsville, N. Y.—Capitalists of this place are talking of constructing a trolley line from here to Bath, thence to Lake Keuka.

Indianapolis, Ind.—The Indianapolis & Martinsville Electric Railway Company was lately incorporated with \$600,000 capital stock and will begin the construction of an electric road from here to Martinsville, 30 miles distant. Chas. F. Smith is at the head of the company.

La Grange, Mich.—The township of LaGrange, Cass County, has granted a franchise to the Van Cleave electric road which is expected to run to Benton Harbor.

Macedon, N. Y.—The Macedon Electric Railway Company, capitalized at \$30,000, has been incorporated by Charles A. Lux, Clyde; S. P. Nichols, Palmyra and E. B. Norris,odus.

Monroe, Mich.—The Monroe Traction Company of this city has been incorporated with \$10,000 capital stock.

Mount Joy, Pa.—A charter has been granted by the State department for a trolley line from Lancaster to this place. The authorized capital stock is \$300,000.

Oklahoma, Okla.—The Oklahoma Street Railway Light, Power & Improvement Company was lately incorporated with C. F. Colord president, C. F. Gilpin, secretary. The charter gives the company a right to build lines to Guthrie, Elreno and other places in the territory.

Paulsboro, N. J.—It is stated that the Frick-Morse steel syndicate that is to build a plant here has become interested in the Paulsboro Traction Company, and will furnish a good part of the capital necessary to build the road.

Providence, R. I.—It is announced that electricity will soon permanently replace steam as a motive power on the Consolidated Railroad's branch line be-

tween this city and Bristol, 14 miles, and Providence and Fall River, 19 miles.

Saco, Me.—The Saco Valley Electric Railway Company has been organized with \$250,000 capital stock. The proposed road will run from here to Buxton and thence to Standish, a distance of 20 miles.

Troy, N. Y.—The Troy, Rensselaer & Pittsfield Railroad Company was recently incorporated with a capital of \$350,000 to operate a high speed electric road 35 miles long, in Rensselaer and Columbia Counties to terminate in this city and Rensselaer and at the boundary line between New York and Massachusetts in the town of New Lebanon. The directors are Edward F. Murray, Rice E. Ball, James W. Donnelly, Cornelius V. Collins, William H. Draper, Anthony P. Finder and Joseph C. Behan of Troy, William D. Barnes of Brainard and Matthew A. Heeran of Rensselaer.

Warren, O.—The Ohio River & Youngstown Railway Company has been incorporated for \$10,000. The company is authorized to build an electric railway through Mahoning and Columbiana Counties.

Youngstown, O.—Messrs. J. Stambaugh, S. L. Jackson and other Youngstown capitalists are organizing a company, with \$500,000 capital stock, for the purpose of furnishing this city with another electric street railway.

Manufacturing.

Ft. Wayne, Ind.—The plant of the bankrupt Belden Larwell Electric & Manufacturing Company was sold at public auction recently to the Fort Wayne Smelting & Refining Company for the sum of \$14,300.

Company Matters.

Chicago.—The Harvard Electric Company of this city has increased its capital stock from \$2,500 to \$10,000.

York, Pa.—The Arrowsmith Electric Company, Limited, whose headquarters are at Reading, has opened a branch supply house in this city. The firm will engage in contracting for electrical equipment of all kinds, sell supplies, novelties and staple articles connected with the utilization of current.

Power and Transmission.

Manitou, Col.—The Pike's Peak Power Company will shortly begin work on a big electrical power plant near Lake Moraine, on Pike's Peak. This plant is designed to furnish current for this place, Cripple Creek and Gillet.

Peach Bottom, Pa.—An electric plant is to be established here by the Susquehanna Electric Light & Power Company, recently organized with a capital of \$12,000,000. The plant will be operated by water power, and it is proposed to harness the Susquehanna River for this purpose. Electricity will be transmitted to Baltimore, a distance of 40 miles.

Potsdam, N. Y.—The Hannawa Falls Water Power Company is making arrangements to supply this village with electricity.

Vancouver, B. C.—The Stave Lake Power Company has recently acquired a franchise from this city, giving it the right for 50 years to do business as a power company within the corporate limits of Vancouver. The engineer of the company reports that 17,000 hp. can be developed at the Falls, and that this amount of power can be duplicated at another point lower down on the stream.

Automobiles.

Cincinnati, O.—The Auto Construction Company has been organized here with a capital of \$10,000. Samuel Newman, Morris Borsodi, Mabel Lazarus, George Nunner and Alois Orlik hold an interest in the concern.

Los Angeles, Cal.—The Western Duryee Manufacturing Company is soon to build a \$75,000 plant for the purpose of manufacturing automobiles.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by **ELECTRICITY** from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: cert. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debenture; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apl. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.						PASSENGER RAILWAYS.							
NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.		
		Authorz'd	Issued.					Authorz'd	Issued.				
Albany, N. Y. May 6						Hartford Conn.—May 6							
United Traction.....	100	\$5,000,000	\$5,000,000	1 1/2 % Q.	117 1/2	108 1/2	Hartford Street Ry. Co.....	100	34,000,000	\$200,000	1 1/2 % S., Oct.,	150	—
(Consolidation of the Albany and Troy City Railway.)							Hartford & West Hartford RR.....	100	1,000,000	247,000	—	—	—
Allentown Pa.—May 6						Holyoke Mass.—May 6							
Allentown & Lehigh Val. Trac Co		4,000,000	1,500,000	—	—	15	Holyoke Street Ry. Co.....	100	400,000	400,000	8 1/2 % A., June,	207 1/2	212
Bridgeport, Conn.—May 6:							Hoboken N. J.—May 6						
Bridgeport Traction Co.....	100	2,000,000	2,000,000	1 % Aug.,	100	—	North Hudson Co. (N. J.) Ry. Co..	25	1,250,000	1,000,000	8 %	150	—
Baltimore Md.—May 6							Indianapolis, Ind.—May 6						
United Railways & Elec. Co.....	50	24,000,000	18,000,000	—	17 1/2	17 1/2	Indianapolis Street Ry.....	—	5,000,000	5,000,000	—	25	25 1/2
Boston, Mass.—May 6							Lancaster, Pa.—May 6						
New England Street Ry.....	25	5,000,000	1,081,925	1 1/2 % Q., Jan. 15,	—	—	Pennsylvania Traction Co.....	100	10,000,000	9,900,000	—	—	—
North Shore Traction Co.....	100	4,000,000	4,000,000	—	15	16	Lancaster & Col. Electric Ry.....	—	—	87,500	—	—	—
North Shore Traction Co.....	100	2,000,000	2,000,000	5 % S. A. & O.	85	87	West End Street Railway.....	—	—	—	—	—	—
West End Street Ry. Co.....	50	10,000,000	—	8 1/2 % S. Oct.,	98	98 1/2	Louisville, Ky.—May 6						
West End Street Ry. Co.....	50	1,000,000	4,400,000	4 1/2 % S. Jan.,	114	115	Louisville Ry.....	100	4,000,000	8,500,000	1 1/2 %	92	88
Boston Elevated R. R.....	100	10,000,000	—	2 1/2 % Aug. 99,	177	178	Louisville Ry.....	100	2,500,000	2,500,000	2 1/2 % S., Oct. 1,	112	118
Brooklyn N. Y.—May 6:							Minneapolis, Minn.—May 6						
Brooklyn City Ry.....	100	2,000,000	1,928,400	—	235	240	Twin City Rapid Transit.....	100	17,000,000	15,010,000	—	68 1/2	68 1/2
Brooklyn Rap. Transit Co., tr. certf.	100	48,000,000	48,000,000	—	84 1/2	81 1/2	Twin City Rapid Transit.....	—	8,000,000	1,712,200	1 1/2 % Oct.,	186	187
Brooklyn Heights Railroad.....	—	200,000	200,000	—	107	109	Montreal, Canada.—May 6						
Brooklyn City RR.....	100	12,000,000	12,000,000	3 1/2 % Q., Jan.,	257	259	Montreal Street Ry. Co.....	50	4,000,000	4,000,000	8 % S. M. & N.	275	279
Brooklyn Queens Co. & Sub. RR.....	100	2,000,000	2,000,000	—	—	—	Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1 1/2 % S. J. & J.	110	110 1/2
Queens Island & Brooklyn RR.....	100	2,000,000	1,884,200	2 1/2 % Nov., '99	325	332	Memphis Tenn.—May 6						
Kings County Elevated.....	100	4,750,000	4,750,000	—	—	—	Memphis Street Railway Co.....	100	500,000	500,000	—	25	—
Kings County Traction Co.....	100	4,500,000	4,500,000	1 % July	75	80	New Haven, Conn.—May 6:						
Nassau Electric Railroad.....	50	6,000,000	6,000,000	—	—	—	Fair Haven & Westville RR.....	25	2,000,000	2,000,000	8 % S., Sept.	89	41
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000	—	—	—	New Haven Street Railway Co.....	100	1,250,000	1,000,000	2 1/2 % A., July	—	—
Brooklyn, B. & W. E. Railroad.....	—	1,000,000	1,000,000	—	—	—	New Haven & Centerville RR.....	100	700,000	800,000	—	—	—
Buffalo N. Y.—May 6:							Winchester Avenue RR.....	25	1,000,000	800,000	—	45	46
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	—	74	75	New Orleans, La.—May 6						
Buffalo Railway Co.....	100	6,000,000	5,870,500	1 1/2 % Q. Dec., 99	99	100	Canal & Claiborne RR. Co.....	40	240,000	240,000	4 % S., July,	—	—
Columbus O.—May 6							New Orleans & Carrollton RR.....	100	1,200,000	1,200,000	1 1/2 % Q., Oct.	148 1/2	158
Columbus Street Railroad.....	100	8,000,000	8,000,000	1 % Q., Feb.	88	88 1/2	New Orleans Traction Co new com.	100	—	—	—	22 1/2	24
Columbus Street Railroad, pfd.....	100	1,500,000	1,500,000	—	92	93	New Orleans Traction Co new pfd.	100	—	—	—	95	96
Charleston, S. C.—May 6							Crescent City RR.....	100	2,000,000	2,000,000	8 % S., Jan.,	20 1/2	26
Charleston City Ry. Co.....	50	100,000	100,000	8 % S.	—	—	New Or. City & Lake RR.....	100	2,000,000	2,000,000	4 % S., Jan.,	—	—
Enterprise City RR. Co.....	25	1,000,000	250,000	—	—	—	Orleans Railroad.....	50	500,000	185,000	1 1/2 % S., Jan.,	—	—
Chicago Ill.—May 6							St. Charles Street Railway.....	50	1,000,000	1,000,000	1 1/2 % Oct.,	56 1/2	57
Chicago City Ry. Co.....	100	12,000,000	12,000,000	3 % Q., Dec. 31,	250	260	New York—May 6						
Chicago & South Side R. T. RR.....	100	10,828,800	10,828,800	—	14	14 1/2	Central Crostown Rk.....	100	600,000	600,000	2 1/2 % Q.	255	200
Lake Street Elevated RR.....	100	10,000,000	10,000,000	—	8 1/2	8 1/2	Christopher & 10th Sts. RR. guar.	100	650,000	650,000	2 % Q., Oct.,	175	85
Metropolitan West Side Elev. Ry....	100	15,000,000	7,000,000	Feb 28 1900.	8 1/2	8 1/2	Dry Dock, E. Brdwy & Battery RR.	100	1,200,000	1,200,000	1 1/2 % Q., Nov.	120	85
Met. West Side El., pfd.....	100	15,000,000	9,000,000	—	8 1/2	8 1/2	Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000	2 1/2 % Q., Feb. 1900.	170	170 1/2
North Chicago Street RR.....	100	10,000,000	6,000,000	3 % Q., Jan.	209	210	Bleeker St. & Fulton St. Ry. guar.	100	900,000	900,000	2 1/2 % A., July,	85	87
North Chicago City Ry. Co.....	100	500,000	249,900	—	197	200	Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000	2 1/2 % Q.	226	240
South Chicago City Railway.....	100	2,000,000	1,608,200	—	118	119	Gen. Park N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2 1/2 % Q.	205	210
West Chicago St. RR. Co.....	100	20,000,000	18,189,000	1 1/2 % Q., Feb	105 1/2	106	Elmth Avenue RR.....	100	1,000,000	1,000,000	4 1/2 % Q.	390	405
Union Traction Ry.....	100	1,250,000	624,900	35 %	14	14 1/2	42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	4 1/2 % Q.	392	402
Union Traction Co.....	100	2,000,000	2,000,000	5 % S.	56	57	Ninth Avenue Rk.....	100	800,000	800,000	—	198	201
Cincinnati, Ohio.—May 6							Sixth Avenue RR.....	100	2,000,000	2,000,000	—	204	205
Cincinnati Inc. Plane Ry.....	50	1,000,000	875,000	—	—	—	Twenty-third St. R. R. Co. guar.	100	600,000	600,000	4 1/2 % Q.	400	410
Cincinnati Inc. Plane Ry.....	50	150,000	150,000	—	—	—	Second Avenue RR.....	100	2,500,000	1,852,000	2 % Q., Jan.	2	212
Cincinnati, Newport & Cov. St. Ry.	100	3,000,000	8,500,000	2 1/2 % Feb.	75	76	Third Avenue RR.....	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.	124 1/2	124 1/2
Cincinnati Street Ry. Co.....	50	18,000,000	14,000,000	1 1/2 % Q., Jan.	24	25	42d St., Manhattan & St. Nich. Av	100	2,500,000	2,500,000	—	65	75
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1 1/2 % Q., Jan.	26	127	Union (Hueckelberry) Ry.....	100	2,000,000	2,000,000	—	190	200
Cleveland, Ohio.—May 6							Newark N. J. May 6						
Akron, Bed. & Cleve. Elec. Ry.....	100	1,000,000	1,000,000	3 1/2 % Jan.	48	50	Consolidated Traction Co. of N. J.....	100	15,000,000	15,000,000	—	67 1/2	68 1/2
Cleveland City Ry.....	100	8,000,000	7,600,000	3 1/2 % Jan	102	102 1/2	North Jersey Railway Co.....	100	8,000,000	6,000,000	—	24	24 1/2
Cleveland Electric Ry.....	100	12,000,000	12,000,000	3 1/2 % Q. Oct.	88	88 1/2	United Elec. Co. of New Jersey..	100	504,000	504,000	11 1/2 % A.	25	26
Detroit, Mich.—May 6							Pittsburg, Pa.—May 6						
Detroit Citizens' Street Ry.....	100	2,000,000	1,250,000	—	100 1/2	—	Allegheny Traction Co.....	50	500,000	500,000	—	27	28
Fl. Wayne & Belle Isle Ry.....	100	1,200,000	1,200,000	—	175	—	Consolidated Traction Co.....	50	15,000,000	15,000,000	2 % Jan.	28	24
Rapid Railway Co.....	100	250,000	250,000	—	90	100	Consolidated Traction Co.....	50	9,478,850	9,478,850	8 % Nov.	61 1/2	61
Detroit Electric Railway.....	100	1,000,000	1,000,000	—	—	—	Central Traction Co.....	50	1,500,000	1,500,000	1 1/2 % Nov.	73 1/2	73 1/2
Wyandotte & Detroit River Ry.....	100	250,000	200,000	—	100	110	Citizens' Traction Co.....	50	8,000,000	8,000,000	6 % A.	72 1/2	72 1/2
Dayton O.—May 6							Duquesne Traction Co.....	50	8,000,000	8,000,000	6 % A.	—	—
City Railway Co.....	100	1,500,000	1,470,600	1 1/2 % Q.	140	145	Pittsburg Traction Co.....	50	2,500,000	2,500,000	8 1/2 % Nov.	—	—
Dayton Street Railway.....	100	400,000	400,000	—	170	—	Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2 1/2 % July,	27	29
Dayton Street Railway.....	100	400,000	400,000	—	170	—	Pgh., Allegheny & Man. Trac. Co.....	50	8,000,000	8,000,000	2 % Aug.	—	—
Dayton Street Railway.....	100	400,000	400,000	—	170	—	Pittsburg & Birmingham Trac. Ry..	25	1,500,000	1,500,000	1 % Oct.	41	42 1/2
Dayton Street Railway.....	100	400,000	400,000	—	170	—	Pittsburg & West End Ry.....	50	8,000,000	8,000,000	5 % A., June	18 1/2	18 1/2
Dayton Street Railway.....	100	400,000	400,000	—	170	—	United Traction Co.....	50	17,000,000	17,000,000	—	—	—
Dayton Street Railway.....	100	400,000	400,000	—	170	—	United Traction Co.....	50	17,000,000	17,000,000	—	—	—

* Unlisted. † Ex div.
 a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.
 b Leased to Boston Elevated Railroad Company.
 c Owned by Brooklyn Rapid Transit Company.
 d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
 e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
 f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
 g Owned by Atlantic Ave. RR. and leased to Nassau system.
 h \$20 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; \$200 of stock owned by North Chicago Street Railroad Company.
 i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
 j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,100 of stock owned by West Chicago Street Railroad Company.
 k Majority of stock owned by Chicago West Division Railway Company; 5 % on \$1,000,000 stock guaranteed by Chicago West Division Railway Company, lessee.
 l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex-div.
 a Leased to New Orleans Traction Company at 6 % on stock.
 b Leased to New Orleans Traction Company at 8 % on stock.
 c Leased to Central Crostown Railroad at 8 % on stock and interest on bonds.
 d Operating the former Met. Trac. system, that corporation having become extinct.
 e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
 f Leased to Houston, West Street & Pavyonia Ferry—now Metropolitan Street Ry.
 g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
 h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1893, at \$215,000 per annum.
 i Leased to Met. St. Ry. for 99 years from April 20, 1892, at \$145,000 per annum.
 j Leased to Metropolitan Street Railway for \$145,000 per annum.
 k Leased to Metropolitan Street Railway for 18 % on capital stock.
 l Controlled by Third Avenue Railroad by purchase.
 m Dividends of 1 1/2 % yearly guaranteed by Consolidated Traction Company.
 n Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.
 o Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
 p Leased to Fort Pitt Traction Company for 6 % on \$8,000,000 capital stock.
 q Leased to Consolidated Traction Company for 4 % on capital stock.
 r Leased to Consolidated Traction Company for 7 % on capital stock.

TELEPHONE AND TELEGRAPH CO.

- * Unlisted. † Paid in. ‡ Full paid. § Outstanding. ¶ Ex-div.
- a Leased to Hestonville, Man & Fairmount Passenger Ry. for 6% on stock per annum.
- b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
- c Practically all shares owned by Union Traction Company.
- d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
- e Leased to Electric Traction Company.
- f Controlled by Frankford & Southwark Passenger Railway.
- g Leased to People's Passenger Railway at \$5 per share.
- h Majority of stock owned by People's Traction Company.
- i Leased to Union Traction Company.
- j Lease transferred to Union Traction Company.
- k Leased to Union Traction Company at a rental of \$10,000 per annum in 1886-7-8; in 1890-1899 and \$30,000 per annum thereafter, payable semi-annually, rental decreased as a dividend semi-annually.
- l Dividend of 10% guaranteed by Reading Traction Company.
- m Dividend of 6% guaranteed by Reading Traction Company.
- n Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

Boston, Mass.—May 6

Boston, Mass.—May 6							
Port Wayne Electric trust receipts..	..	.....	.....	....		115	125
Fl. Wayne Elec Co. T. Sec. Series A.	25	.....	.....	.....		15	25
†General Electric Co. [old].... com.	100	40,000,000	80,460,000	2% Q., Aug., 1898.		...	...
General Electric Co. [new].....	100	18,376,000	18,376,000	1% Q., Apr., 1901		228%	228%
T.-H. Elec. Co. T. Secur., Series C.	..	.....	.....	.....		32	28
Westinghouse Elec. & Mfg. Co. com.	50	.....	148,700	.....		65	65%
Westinghouse El. & Mfg. Co. pfd.	50	4,000,000	8,998,058	1% Q., Jan.,		75%	76%
Westinghouse El. & Mfg. Co. rights.	50	11,000,000	8,195,126	.....		1%	1%
New York.—May 6							
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	.....		119	120
*Edison Elec. Ill'g Co., Brooklyn.	100	4,000,000	2,000,000	1% Q., Oct., '98.		...	...
Edison Ore Milling Co. com.	100	.....	.....	.....		8	12
Electric Vehicle Co. com.	..	.....	.....	.....		...	...
†General Electric Co. [old].... com.	100	40,000,000	80,460,000	2% Q., Aug., 1898.		...	...
General Electric Co. [new].....	100	18,376,000	18,376,000	1% Q., Apr., 1901		229%	229%
Interior Conduit & Insulation Co...	100	1,000,000	1,000,000	.....		41	...
† Kings Co. El. L. & P. Co. com.	100	2,500,000	2,500,000	A. & O.		110	126
Pittsburg, Pa.—May 6							
Allegheny County Light Co. com.	100	500,000	500,000	J. & J.		100	15
East End Electric Light Co. com.	50	800,000	800,000	Q		...	...
Philadelphia, Pa.—May 6							
Edison Electric Light Co. com.	100	2,000,000	.....	.....		144	144%
*Electric Storage Battery Co. com.	100	8,500,000	.....	.....		85	85
*Electric Storage Battery Co. pfd.	100	5,000,000	.....	.....		95	67
Northern Elec. Light & Power Co..	10	550,000	550,000	.....		18	18%
Southern Elec. Light & Power Co..	10	187,500	187,500	.....		80	...
Miscellaneous.—May 6							
Bridgeport (Conn.) Elec. Lt. Co.	25	800,000	.....	.....		47	48
Missouri-Edison (St. Louis).... com.	..	.....	.....	.....		20	21
Eddy Electric Mfg. Co. com.	25	.....	.....	.....		9	14
Hartford (Conn.) Elec. Light Co....	100	880,000	.....	.....		176	176
Hartford (Conn.) Lt. & Power Co..	25	175,000	.....	.....		6	19
New Haven (Conn.) Elec. Lt. Co....	100	100,000	.....	.....		196	...
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	.....	2% Q., Oct.,		102	101
Rhode Island Elec. Prot. Co.	100	.....	.....	.....		118%	120%
Royal Elec. Co. (Montreal).....	..	1,220,000	.....	1% Q.		240	244
Toronto (Canada) Elec. Light Co....	100	1,085,000	1,085,000	1% Q.		187%	188
Thomson-Houston Welding Co.	100	.....	.....	5% S., Dec. 1,		...	100
Woonsocket (R. I.) Electric Co....	100	.....	.....	.....		106	106

† On Aug. 17 last by a majority vote of the stockholders the capital stock was reduced to \$20,827,200, of which \$18,276,000 is common and \$2,551,200 preferred. ‡ Ex div.
§ Recently acquired the Edison Illuminating Co. of Brooklyn and its constituent companies, the Municipal Electric Light Co.

Boston Mass.—May 6										
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Boston Mass.—May 6:					
American Electric Heating Co.....	50	10,000,000			
Street Ry. & Illu'g Properties... pfd	100	4,500,000	1,248,700	32 p. sh.	
United Electric Securities Co... pfd.	100	.....	1,000,000	33.50 p.sh.	
New York.—May 6:					
Consolidated Electric Storage Co...	...	.....	.....	.....	8 12
Safety Car Heating & Lighting Co...	100	.....	.....	.....	150 165
Worthington Pump Co.....com.	100	5,500,000	5,500,000	.....	118 114
Worthington Pump Co.....pfd	100	2,000,000	2,000,000	7 % A	
Philadelphia Pa.—May 6					
Electro Pneumatic Trans. Co.	10	1,500,000	.....	.....	1% 1%
United Gas Improvement Co..scrip.	50	10,000,000	.....	.....	20% 21%
Weisbach Commercial Co.....com.	100	8,500,000	.....	.....	7% 7%
Weisbach Commercial Co.....pfd.	100	500,000	.....	2 % Q	58 51
Weisbach Light Co.....	5	525,100	.....	.....	1 1%
Weisbach Light Co., Canada.....	5	500,000	.....	.....	
Pittsburg, Pa.—May 6:					
Carborundum Mfg. Co.....	100	200,000	200,000	.....	211 212
Standard Underground Cable Co...	100	1,000,000	1,000,000	Q	
Miscellaneous.—May 6:					
Barney & Smith Car Co.....com.	100	.....	1,000,000	.....	24 25%
Barney & Smith Car Co.....pfd.	100	.....	500,000	1 %	180 181
Hillings & Spencer Co.....	25	.....	.....	.....	80 55
Consol. Car Heating Co.....	100	1,250,000	1,250,000	1% % Feb	105 100
Cabine-Pratt Co.....	100	.....	.....	.....	85 90
Pratt & Whitney Co.....com.	100	.....	.....	.....	80 80
Pratt & Whitney Co.....pfd	100	.....	.....	.....	80 80
Hillwell-Bierce Co.....com.	100	.....	.....	.....	80 80
Hillwell-Bierce Co.....pfd.	100	.....	.....	2 % Sept 1, '99.	80 80
Bulfinch Belting Co.....	100	500,000	.....	.....	80 80
Charles Car Co.....	100	.....	.....	.....	80 80
Unlisted					

BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

Albany N. Y.							New Orleans La.						
Date of Quotation—May 6, 1901.							Date of Quotation—May 6, 1901.						
NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.	NAME.	Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.
The Albany Ry. Co. Cons. mtg. 5s.	\$500,000	427,500	1940	J. & J.	117 1/2	118	Canal & Claiborne RR. Cons. mtg. 5s.	\$150,000	\$150,000	1912	M. & N.	105 1/2	106 1/2
The Albany Ry. Co. Gen. mtg. 5s.	750,000	875,000	1947	M. & N.	118 1/2	119	Crescent City RR. Cons. mtg. 5s.	5,000,000	8,000,000	1908	J. & J.	108	112
Watervliet Turnpike & RR. 1st mtg. 5s.	850,000	850,000	1919	M. & N.	112 1/2	117	New Orleans City & Lake RR. 1st mtg. 5s.	415,500	899,000	1908	J. & J.	108	112
Watervliet Turnpike & RR. 2d mtg. 5s.	180,000	180,000	1919	M. & N.	112 1/2	117	N. Orleans City & Lake RR. 2d mtg. 5s.	5,000,000	2,599,500	1948	J. & J.	112	118
Troy City Railway Co. 1st 5s.	....	....	1942	....	116	117	N. Orleans & Carrollton RR. 2d mtg. g. 5s.	850,000	850,000	1907	F. & A.	....	....
Interest guar. by Albany Ry. Co. Principal and interest guar. by Albany Ry. Co.							Orleans Railroad Co. Cons. mtg. 5s.	800,000	800,000	1912	J. & J.	....	....
							1st Charles St. RR. Co. 1st mtg. 5s.	800,000	75,000	1907	J. & J.	....	....
							18428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds. 1900,000 outstanding.						
Baltimore Md.							New York.						
Date of Quotation—May 6, 1901.							Date of Quotation—May 6, 1901.						
United Electric Ry. Co. 1st mtg. g. 4s	88,000,000	18,000,000	1949	M. & S.	102	102 1/2	Atlantic Ave. (Brooklyn) Imp. g. 5s.	1,500,000	1,500,000	1904	J. & J.	95	105
United Electric Ry. Co. Income 4s.	14,000,000	....	1949	J. & D.	74 1/2	75	Atlantic Ave. (Brooklyn) 1st gen. mtg. 5s.	759,000	759,000	1909	M. & S.	107 1/2	110
Baltimore City Pass. Ry. 1st mtg. g. 5s.	2,000,000	2,000,000	1911	M. & N.	118 1/2	120	Atlantic Ave. (Brooklyn) Cons. mtg. 5s.	8,000,000	1,966,000	1901	A. & O.	115	116
Baltimore Traction Co. 1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	119	120	Broadway & 7th Ave. 1st cons. mtg. 5s.	12,500,000	7,650,000	1948	J. & D.	128	128
Baltimore Traction Co. 2d mtg. 5s.	1,250,000	1,250,000	1901	M. & S.	104 1/2	105	Broadway & 7th Ave. 1st mtg. 5s.	1,500,000	1,500,000	1904	J. & D.	104	105 1/2
Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s.	1,750,000	1,750,000	1942	J. & D.	121	121 1/2	Broadway & 7th Ave. 2d mtg. 5s.	500,000	500,000	1904	J. & J.	106	110 1/2
Bal. Trac. Co. Coll. Trust 1st mtg. g. 5s.	750,000	....	1900	J. & J.	101	101	Broadway Surface 1st mtg. 5s.	1,125,000	1,125,000	1904	....	115	117
Baltimore Traction Co. Convertible 5s.	800,000	....	1908	N. & M.	108 1/2	109	Broadway Surface 2d mtg. 5s.	1,000,000	1,000,000	1905	....	106	108
Central Pass. Ry. Co. 1st mtg. 5s.	96,000	117,000	1912	J. & J.	101	101	Brooklyn City RR. Co. 1st cons. mtg. 5s.	5,000,000	5,000,000	1941	J. & J.	116	117
Central Pass. Ry. Co. Cons. mtg. 5s.	804,000	880,000	1928	M. & N.	119	121	Brooklyn City & Newtown 1st mtg. 5s.	2,000,000	2,000,000	1908	J. & J.	115	116
City & Suburban Ry. 1st mtg. g. 5s.	8,000,000	8,000,000	1929	J. & D.	116	117	Brooklyn Bath & W.E. RR. Gen. mtg. 5s.	1,000,000	448,000	1908	J. & J.	101	101
Lake Roland Elev. 1st mtg. 5s.	1,000,000	1,000,000	1942	M. & S.	117	117	Brooklyn Heights RR. 1st mtg. 5s.	250,000	250,000	1941	A. & O.	104	104
All of the bonds of the above companies, marked t, have been assumed by the United Railways & Electric Company.							Brooklyn, Q's Co. & Sub'n. 1st mtg. 5s.	8,500,000	8,500,000	1941	J. & J.	112	112
							Brooklyn, Q's Co. & Sub'n. 1st cons. 5s.	4,500,000	2,750,000	1941	M. & N.	107	107
							Brooklyn Rapid Transit. gold 5s.	7,000,000	5,181,000	1945	....	109 1/2	109 1/2
							Bleeker St. & Fulton Ferry RR. 1st mtg. 7s.	700,000	700,000	1900	....	98 1/2	100 1/2
							Cent Pk. N. & E. RR. 1st cons. mtg. 4s.	1,200,000	1,200,000	1902	J. & D.	107	109
							Central Cross-town RR. 1st mtg. 5s.	250,000	250,000	1922	M. & N.	125	125
							Coney Island & Brooklyn RR. 1st mtg. 5s.	800,000	800,000	1908	J. & J.	101	108
							2d Dock, E. Bd'y & Bat'y RR. gen. mtg. 5s.	1,000,000	980,000	1902	J. & D.	117	120
							Dry Dock, E. Bd'y & Bat'y RR. scrip 5s.	100,000	1,100,000	1914	F. & A.	102	105
							Elm St. Av. RR. Co. Cert. Indeb. 6s.	1,000,000	1,000,000	1914	F. & A.	108	108
							42d St., Man. & St. Nich. Av. 1st mtg. 5s.	1,200,000	1,200,000	1910	M. & S.	116 1/2	117
							42d St., Man. & St. N. Av. 2d mtg. inc. 5s.	1,500,000	1,500,000	1915	J. & J.	89	89
							Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1908	M. & S.	124	125
							Metropolitan St Ry Co. g. m. cl. tr. g. 5s.	12,500,000	17,500,000	1907	F. & A.	120	120
							Second Avenue Ry. Gen. cons. mtg. 5s.	1,600,000	1,600,000	1909	M. & N.	120	121
							Second Avenue Ry. Deb. 5s.	800,000	800,000	1909	J. & J.	108 1/2	109
							Steinway Ry. (L. I.) 1st mtg. g. 5s.	1,500,000	1,500,000	1922	J. & J.	116	117
							South Ferry RR. Co. 1st mtg. 5s.	850,000	850,000	1919	....	110 1/2	112 1/2
							Third Avenue RR. 1st mtg. g. 5s.	5,000,000	5,000,000	1907	J. & J.	108	108
							Twenty-third Street Ry. 1st mtg. 5s.	150,000	150,000	1909	J. & J.	106	108
							Twenty-third Street Ry. Deb. 5s.	2,000,000	2,000,000	1942	F. & A.	118	118
							Westchester Electric RR. 1st mtg. 5s.	500,000	500,000	1948	J. & J.	110	114
							181,085,000 in escrow to retire gen. mtg. bonds. 124,850,000 in escrow to retire maturing obligations. 185,922,000 in escrow to retire 1st and 2d mtg. bonds. In treasury, \$80,000. Guar. by Union Ry. Co.						
Boston Mass.							Toronto Canada.						
Date of Quotation—May 6, 1901.							Date of Quotation—May 6, 1901.						
Lynn & Boston RR. 1st mtg. g. 5s.	5,879,000	3,708,000	1924	J. & D.	114	115	Montreal St. Ry. 1st mtg. 5s.	2,500,000	800,000	1908	M. & S.	....	....
West End Street Ry. Deben. g. 5s.	8,000,000	3,000,000	1902	M. & N.	104 1/2	106	Toronto St. Ry. 1st mtg. g. 4 1/2s.	4,550,000	2,200,000	1921	M. & S.	....	....
West End Street Ry. Deben. g. 4 1/2s.	2,000,000	2,000,000	1914	M. & S.	112	112	185,000 per m. single track authorized. 2600,000 in escrow to retire 5s due in 1901.						
181,074,000 in escrow to retire outstanding bonds of absorbed companies.													
Charleston S. C.							Philadelphia.						
Date of Quotation—May 6, 1901.							Date of Quotation—May 6, 1901.						
Enterprise Street RR. 1st mtg. 5s.	500,000	47,000	1906	J. & J.	....	....	Continental Pass. Ry. 1st mtg. 5s.	850,000	810,000	1909	J. & J.	....	....
Charleston City Ry. 1st mtg. 5s.	850,000	....	....	J. & J.	106	106	Empire Pass. Ry. 1st mtg. 7s.	800,000	200,000	1900	J. & J.	....	....
Controlled by Charleston St. Ry. Co.							Greene & Coates St. Ry. 1st mtg. 5s.	100,000	100,000	1898	J. & J.	....	....
							Lombard & So. St. Pass. Ry. 1st mtg. 5s.	150,000	....	1901	....	....	....
							People's Pass. Ry. 1st mtg. 7s.	250,000	250,000	1905	J. & J.	....	....
							People's Pass. Ry. 2d mtg. 5s.	500,000	458,000	1911	J. & J.	....	....
							People's Pass. Ry. Cons. mtg. 5s.	1,125,000	867,000	1912	M. & S.	....	....
							People's Pass. Ry. Stk. trs. cert. g. 4s.	5,698,210	....	1948	....	....	....
							Phila. City Passenger Ry. 1st mtg. 5s.	200,000	200,000	1910	J. & J.	....	....
							Philadelphia Trac. Co. Coll. tr. g. 4s.	1,800,000	1,018,000	1917	F. & A.	....	....
							Thirteenth & 15th St. Ry. 1st mtg. 7s.	100,000	100,000	1908	A. & O.	....	....
							Union Passenger Ry. 1st mtg. 5s.	500,000	500,000	1911	A. & O.	....	....
							Union Traction Co. Coll. tr. 4s.	29,735,000	29,734,876	1945	A. & O.	....	....
							West End Passenger Ry. 1st mtg. 7s.	....	....	1905	....	....	....
							West Phila. Pass. Ry. 1st mtg. g. 5s.	250,000	246,000	1906	A. & O.	....	....
							West Phila. Pass. Ry. 2d mtg. 5s.	750,000	750,000	1926	M. & N.	....	....
							The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.						
Cincinnati O.							Pittsburg Pa.						
Date of Quotation—May 6, 1901.							Date of Quotation—May 6, 1901.						
Cin. New & Cov. St. Ry. 1st Cons. mtg. g. 5s.	8,000,000	2,500,000	1928	J. & J.	114 1/2	115	Birmingham, Knox & Allentown. 5s.	500,000	500,060	1981	M. & S.	111 1/2	111 1/2
Mt. Adams & Eden Pk In. 1st mtg. 5s.	46,000	46,000	1900	A. & O.	108 1/2	104	Central Traction Co. 1st mtg. 5s.	875,000	875,000	1980	J. & J.	....	....
Mt. Adams & Eden Pk In. 2d mtg. 5s.	100,000	100,000	1905	A. & O.	114	114	Citizens' Traction Co. 1st mtg. 5s.	1,250,000	1,250,000	1927	A. & O.	....	....
Mt. Adams & Eden Pk In. Cons. mtg. 5s.	581,000	581,000	1906	M. & S.	108 1/2	108 1/2	Duquesne Traction Co. 1st mtg. 5s.	1,500,000	1,500,000	1980	J. & J.	....	....
Cov. & Cin. St. Ry. 1st mtg. 5s.	250,000	250,000	1912	M. & S.	121 1/2	122 1/2	Fed'l St. & Pleasant Valley. Jack's Run. 5s.	50,000	50,000	1918	J. & J.	....	....
Cov. & Cin. St. Ry. 2d mtg. 5s.	400,000	400,000	1912	J. & J.	122 1/2	127	Fed'l St. & Pleasant Valley. Cons. 5s.	1,250,000	1,250,000	1942	J. & J.	....	....
Assumed by the Cin. St. Ry. Co.							Millvale, Etna & Sharpsho. 5s.	750,000	750,000	1928	M. & N.	110	118
1980,000 reserved to retire 1st mtg. bds.							Pittsburg, Crafton & Mansfield. 5s.	250,000	250,000	1924	J. & J.	....	....
							Pittsburg Traction Co. 1st mtg. 5s.	750,000	750,000	1927	A. & O.	....	....
							Pittsburg & Birmingham. 1st mtg. 5s.	1,500,000	1,500,000	1929	M. & N.	112	118
							Pittsburg & West End. 1st mtg. 5s.	500,000	500,000	1922	J. & J.	....	....
							Pgh., Allegh. & Manch. Gen. mtg. 5s.	1,500,000	1,400,000	1980	A. & O.	....	....
							Second Ave. Traction Co. 1st mtg. 5s.	2,500,000	2,023,000	1984	J. & D.	....	....
							Sub. Rapid Transit Railway Co. 5s.	600,000	500,000	1912	W. & S.	....	....
Cleveland O.							Providence R. I.						
Date of Quotation—May 6, 1901.							Date of Quotation—May 6, 1901.						
Brooklyn Street RR. Co. 1st mtg. 5s.	600,000	600,000	1908	M. & S.	106 1/2	107	Newport Street Ry. 1st mtg. 5s.	50,000	50,000	1910	J. & D.	....	....
Cin. New & Cov. St. Ry. Cons. mtg. 5s.	8,000,000	2,500,000	1922	J. & J.	114 1/2	115	United Trac. & Elec. Co. 1st mtg. g. 5s.	9,000,000	8,260,000	1988	M. & S.	116	118
Cleveland City Cable Ry. 1st mtg. 5s.	2,000,000	2,000,000	1909	J. & J.	106	106							
Cleveland Electric Ry. Co. 1st mtg. g. 5s.	8,500,000	1,249,000	1918	M. & S.	106	107							
Columbus (O.) Cent. Ry. 1st mtg. g. 5s.	1,500,000	1,500,000	1918	M. & N.	....	....							
Cleveland RR. 1st mtg. 5s.	1,000,000	1,000,000	1910	M. & S.	107 1/2	107 1/2							
Wayne (Ind.) Elec. Ry. 1st mtg. g. 5s.	900,000	....	1922	M. & N.	....	....							
Main (O.) Street Ry. 1st mtg. 5s.	200,000	200,000	1915	J. & J.	....	....							
Ry. Co. Grand Rapids. 1st mtg. 5s.	600,000	600,000	1912	J. & D.	....	....							
1,500,000 in escrow to retire bonds of absorbed companies, marked a.													
Interest guar. by Cons. St. Ry. Co.													
Detroit Mich.							St. Louis.						
Date of Quotation—May 6, 1901.							Date of Quotation—May 6, 1901.						
Detroit Citizens' St. Ry. 1st mtg. 5s.	7,000,000	8,885,000	1905	A. & O.	....	102 1/2	Baden & St. Louis RR. 1st mtg. 5s.	250,000	250,000	1918	J. & J.	101 1/2	102 1/2
Wayne & Belle Isle Ry. 1st mtg. 5s.	400,000	877,000	1902	A. & O.	....	106 1/2	Cass Ave. & Fair Gds Ry. 1st mtg. 5s.	1,818,000	1,818,000	1912	J. & J.	101 1/2	102 1/2
Detroit Ry. 1st mtg. 5s.	1,800,000	1,800,000	1926	J. & D.	106	106 1/2	City & Suburban Ry. 1st mtg. 5s.	1,800,000	1,800,000	1907	J. & J.	101	101 1/2
1,150,000 in escrow to retire bonds of City Ry. and Grand River St.													

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods	Bid.	Asked
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—May 6 1901						
Jefferson Avenue Ry.....1st mtg. 5s.	270,000	270,000	1906	M. & N.	112	113
Lindell Ry. Co.....1st mtg. 5s.	1,500,000	1,500,000	1911	F. & A.	107	108
Missouri RR. Co.....	1,000,000	700,000	1916	M. & S.	105	106
Mount City RR. Co.....1st mtg. 5s.	400,000	800,000	1910	A. & O.	104½	105½
People's RR. Co.....1st mtg. 5s.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 7s.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 5s.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric.....1st mtg. 5s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 5s.	2,000,000	2,000,000	1906	M. & N.	99½	100½
St. Louis & Sub. Ry.....1st mtg. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5s.	800,000	800,000	.....	.....	80	84
†Southern Electric Ry.....Cons. mtg. 5s.	500,000	500,000	1909	M. & N.	106	108
†Taylor Avenue St. Ry.....1st mtg. 5s.	500,000	500,000	1918	J. & J.	116½	117½
Union Depot RR. Co.....1st cons. mtg. 5s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.....Cons. mtg. 5s.	8,500,000	1,787,000	1918	J. & J.	121	122
†Controlled by St. Louis RR. Co.						
†Controlled by Union Depot RR. Co.						
†Controlled by Lindell RR. Co.						
†\$200,000 in escrow to retire 1st & 2d mtg.						
†\$500,000 in escrow.						
†\$200,000 in escrow to retire 1st mtg. bds.						
San Francisco Cal.						
Date of Quotation—May 6 1901.						
California St. Cable RR.....1st mtg. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 5s.	650,000	650,000	1914	M. & S.	.....	117
Geary St., Park & Ocean RR.....1st mtg. 5s.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. 5s.	8,000,000	8,000,000	1918	J. & J.	126½	.....
†Metropolitan Ry. Co.....1st mtg.	200,000	.....	.....	.....	.....	.....
†Omnibus Cable Co.....1st mtg. 5s.	2,000,000	2,000,000	1918	A. & O.	126½	.....
†Park & Cliff House RR.....1st mtg. 5s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR.....1st mtg. 5s.	250,000	250,000	1914	J. & J.	115	.....
†Powell St. Ry.....1st mtg. 5s.	700,000	700,000	1912	M. & S.	.....	125
†Sutter St. Ry. Co.....1st mtg. 5s.	1,000,000	900,000	1918	M. & N.	.....	.....
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—May 6 1901						
Belt Ry. Co.....Cons. mtg. 5s.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 5s.	500,000	500,000	1914	A. & O.	182	.....
Rockington & Soldiers' Home.....1st mtg. 5s.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	.....	.....
†\$50,000 in escrow to retire 1st mtg. bds.						
Miscellaneous.						
Date of Quotation—May 6 1901						
Bridgeport Traction Co.....1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 5s.	5,000,000	3,548,000	1981	F. & A.	118	.....
†Citizens' St. R. (Ind'polis).....1st cons. m. 5s.	4,000,000	8,000,000	1988	M. & N.	104	10*
†Crosstown St. Ry. (Buffalo).....1st mtg. 5s.	8,000,000	2,868,000	1982	M. & N.	112	118
†Columbus (O.) St. Ry.....1st cons. 5s.	8,000,000	2,261,000	1982	J. & J.	115	.....
Consolidated Traction (N. J.).....1st mtg. 5s.	15,000,000	18,965,000	1983	J. & D.	111½	111½
†Crosst'n St. Ry. (Columb., O.).....1st mtg. 5s.	2,000,000	572,000	1988	J. & J.	115	115½
†Denver City Cable Ry. Co.....1st mtg. 5s.	4,000,000	8,800,000	1920	J. & J.	20	.....
†Denver Con. Tram'y Co.....Con. m. g. 5s.	4,000,000	922,000	1920	A. & O.	80	85
†Louisville (Ky.) Ry.....1st cons. mtg. 5s.	6,000,000	4,981,000	1980	J. & J.	119	119½
†Minneapolis St. Ry.....1st cons. mtg. 5s.	5,000,000	4,050,000	1919	J. & J.	110½	110½
†No. Hudson Co. Ry. (N. J.).....Cons. mtg. 5s.	8,000,000	2,878,000	1928	J. & J.	108	.....
†No. Hudson Co. Ry. (N. J.).....2d mtg. 5s.	550,000	550,000	1928	M. & N.	.....	.....
†No. Hudson Co. Ry. (N. J.).....Deb. 5s.	500,000	489,000	1902	F. & A.	.....	.....
†Paterson (N. J.) Ry.....Cons. mtg. 5s.	1,250,000	1,000,000	1981	J. & D.	.....	.....
†Rochester (N. Y.) Ry.....1st mtg. 5s.	8,000,000	2,000,000	1980	A. & O.	.....	.....
†St. Paul City Ry.....Cons. g. 5s.	5,500,000	4,298,000	1987	.....	106½	106
†St. Paul City Ry.....Deb. g. 5s.	1,000,000	1,000,000	1900	.....	108	.....
†\$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
†\$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
†\$750,000 in escrow to retire bonds of O. St. RR. Co.						
†\$87,000 in treasury.						
†\$950,000 reserved to redeem prior liens.						
†\$320,000 in escrow.						

*With int' res

ELECTRIC LIGHT AND ELECTRICAL MFG. COCS

Boston, Mass.						
Date of Quotation—May 6, 1901						
Delaware Gas Lt. Co.....1st m. 5s. g.	800,000	800,000	.....	J. & J.	106	10
Edison Elec. Illuminating Co., Boston.....	2,025,000	.....	.....	Quar.	157	.....
General Electric Co., gold coup. deb. 5s.	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa.						
Date of Quotation—May 6, 1901						
Allegheny County Light Co.....5s.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Scrip 6s.	195,570	.....	.....	M. & S.	.....	.....
Miscellaneous. —(May 6, 1901.)						
Edison El. Ilig. Co. (N. York) 1st m. 5s.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilig. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1998	.....	124	.....
Edison Elec. Ilig. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122½	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
†Kings Co. El. Lt. & Pow. Co. 1st mtg. 5s.	2,500,000	.....	1987	A. & O.	100	10½
†Kings Co. El. Lt. & Po. Co. pur. money 6s.	5,176,000	.....	1997	A. & O.	120	122
†Milwaukee El. Ry. & Lt. Co. 1st con. g. 5s.	8,000,000	.....	.....	F. & A.	102½	.....
†United Elec. Light & Power Co. (N. Y.).....	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—May 6, 1901.						
American Bell Telephone.....4s.	.....	.....	1908	F. & A.	100%	101
Northwestern Telegraph Co.....7s.	.....	.....	.....	.....	.....	.....
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 5s.	.....	.....	.....	.....	114	115
Chesapeake & Potomac Teleph. Co.....5s.	.....	.....	1911	J. & D.	108	116

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—May 6 1901						
American Electric Heating.....7s	800,000	800,000	.....	.....	.....	.....
Armington & Sims Engine Co.....5s.	.....	.....	.....	.....	.....	.....
Barnes & Smith Car Co.....5s.	.....	.....	1908	J. & J.	106	107
Carborundum Mfg Co.....5s.	.....	.....	1904	J. & D.	.....	.....
Worthington Pump Co.....5s.	75,000	.....	.....	.....	115	127
Unlisted						
†Woman's						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@16¾c.; Lake, 17@17½c.; casting, 16½@16¾c.

The American Light Company of Philadelphia has been incorporated at Wilmington, Del., with a capital of \$5,000,000.

The advance in Western Union was on the report of an increase in the company's capital, with valuable rights to stockholders.

The Detroit United Railway Company has declared a quarterly dividend of 1 per cent., payable June 1. Books close May 13 and reopen June 2.

Parties who are in touch with the affairs of the General Electric Company state that from present indications the company will show earnings of \$50 per share for the stock this year.

The Delaware General Electric Company has mortgaged its property to the Knickerbocker Trust Company of New York for \$1,000,000 to provide funds for construction of the Kent County trolley.

Within a week electricity will permanently replace steam as motive-power on the Consolidated Railroad's branch line between Providence and Bristol, 14 miles, and Providence and Fall River, 19 miles.

Kidder, Peabody & Co., of Boston have closed subscriptions to the \$2,500,000 American Telephone and Telegraph Company's collateral trust 4 per cent. bonds. The bonds have been largely over subscribed.

The Metropolitan West Side Elevated Railway Company of Chicago made a good showing in April traffic. The daily average traffic in April was 97,018 passengers, against 90,430 in the same month last year.

It is reported that within the next few weeks contracts for more than \$1,000,000 worth of new machinery for the Westinghouse Electric Company will be awarded from the Pittsburg and London offices.

At the annual meeting on Monday of the New England Telephone and Telegraph Company the old board of directors was re-elected. Frederick P. Fish was elected to fill the vacancy of J. E. Hudson deceased. No other business was transacted.

Special meetings of the New York Gas and Electric Light, Heat and Power Company and the Edison Electric Illuminating Company of New York will be held at the company's offices in this city May 20 to vote upon a proposition for the consolidation of the two companies.

Exports of copper for the month of March, as compiled by the United States Bureau of Statistics, amounted to 6,465 tons. During the month of March 2,687 tons of foreign copper and 22,852 tons of ores were imported and 773 tons of copper and 957 tons of ores were re-exported.

The following are quotations for some of the industrial stocks not quoted elsewhere: Electrical Lead Reduction, 4½@5; Electric Boat, 17@21; Electric Vehicle, 10@12; Tel. & Tel. Company of America (full paid) 5½@7; Electric Company of America, 8¼@9; National Carbon, 15¼@15½.

A prominent American Railways interest says: "The matter of a combination of our company and the Electric Company of America has not been placed before either board, but representatives of both companies have met and talked it over informally. I have not heard the question discussed for the last six days, but the idea has not been abandoned."

A dispatch from Boston on Monday says: "Directors of the American Telephone and Telegraph Company say that there is no truth in the rumor that a consolidation of the Western Union, American Telephone and Telegraph Company and other companies is under consideration. If such a plan is being contemplated the directors of the American Telephone and Telegraph Company have not been consulted."

The Union Traction Company, with a capitalization of \$15,000,000, has been incorporated under the laws of Indiana. The company is formed in the interests of the Widener-Elkins-Dolan syndicate. The companies, the securities of which it is intended to pool in the Union Traction Company, are understood to be the Widener-Elkins-Dolan properties in the middle West. The new company has nothing to do with the Philadelphia Union Traction Company.

Redmond, Kerr & Co. offers for subscription at 100 and interest \$8,355.00 first and refunding mortgage 4½ per cent. gold bonds of the Connecticut Railway and Lighting Company. The books open at 10 o'clock Thursday, May 9, and close at 3 o'clock the same day. The bonds are secured by first mortgage, subject only to \$995,000 underlying bonds upon 161 miles of street railway. A large amount of the bonds have been sold to investors and the bankers now reserve the right to allot smaller amounts than applied for.

The approval on Friday by the Massachusetts Railroad Commissioners of a consolidation of the Lynn and Boston Street Railway with the Lowell, Lawrence and Haverhill Street Railway will leave the Lynn and Boston with 61,230 shares of stock representing, what was 18 months ago, 14 corporations. This consolidation leaves but one operating company north of Boston, with 390 miles of track, reaching from Boston to Nashua. The management has under consideration a change of name for this company which will be as comprehensive as the name of the Old Colony Street Railway is to the roads south of Boston.

Messrs. D. Houston & Co., metal brokers, New York, in their regular monthly letter, say: "Although nothing of an exciting character occurred in the market for copper during the past month, there was a good current demand reported, while at the same time the movement into consumption continued on a large scale. Values were maintained on the basis of 17 cents for Lake and 16½ for electrolytic, and the tone was remarkably steady throughout the whole of April. Evidences are accumulating that one of the objective points sought is permanent market stability without the danger of serious drawback."

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EDITORIAL NOTES.

The Horse Shoe Falls at Niagara to be Utilized for Developing Power.

It has frequently been stated that there is sufficient power in the water going to waste at Niagara Falls to move, were it properly harnessed, all the machinery of the world. Thousands of electrical horse-power are already being developed in that locality, and now it is officially announced by the Niagara Falls Power Company that it will at once proceed with the development of the power of the Horse Shoe Falls under the charter of the Canadian Power Company, which it controls. It is proposed ultimately to develop 35,000 horse-power, much of which will be sold to local consumers, about 10,000 horse-power will be transmitted to Toronto and a large amount will be held in reserve for use in connection with the development on the American side of the river. The site of the development is in Victoria Park, but all of the energy generated will be used outside of the park grounds.

It is proposed to construct an inlet canal from the head of Clear Island to the site of the power house where a wheel pit, with a capacity of 100,000 horse-power, will be built. A tall race will carry the water from the turbines to the river below the Horse Shoe Falls. The head of water will be about the same as on the American side of the river and the details of the present Niagara development will be adhered to. The two power houses of the Niagara Falls Power Company at the Falls and the new proposed power house on the Canadian side will be connected by cables, so that an international exchange of electric energy may be made to assure constant service in Niagara Falls; Buffalo and Toronto.

By the agreement between the Commissioners of Victoria Park and the Canadian-Niagara Power Company, the company has until July 1, 1903, to have 10,000 developed horse-power ready for use, supply and transmission and also to have water connections made for 25,000 hp. The company has until July 1, 1904, to clean up and ornament the surfaces of the park which may be disturbed by their work. If the cleaning up and grading are not completed at the time specified then the company is to pay \$10,000 damages and \$500 per week during the period it remains incomplete. The Commissioners on their part agree not

to compete in the development of power, but should they grant privileges to other parties who shall fail to keep their agreement and the Commissioners be forced to take over the plant, then the agreement will not prevent them from operating such works. The power company agrees not to amalgamate with any other company heretofore or hereafter incorporated under the laws of the Dominion without the consent of the Lieutenant-Governor in council.

* * *

The Summer Meeting of the Institute.

The preliminary programme of the summer meeting of the American Institute of Electrical Engineers has just been made public. This programme, which, however, is subject to revision, contemplates having the members of the Institute, as well as the European guests, meet on August 14 in this city, when a formal reception will be held. On the two following days technical visits will be made to important works and installations in this vicinity, while on one of the evenings a banquet will take place.

On Sunday, August 18, there will probably be a daylight trip up the Hudson to some convenient point, where the members and their guests will take train for Albany. On the 19th the works of the General Electric Company at Schenectady will be visited, after which the party will go by special train to Buffalo.

On Tuesday morning, August 20, the General Meeting will open at Buffalo, in the Temple of Music, with addresses by the Exposition and municipal officials. A preliminary visit will be made to the Exposition in the afternoon.

On the three following days there will be sessions for the reading and discussion of papers in the forenoons, and perhaps on some of the afternoons. The Director-General has designated August 22d as "Electrical Day." The programme contemplates the allotment of an entire day, if possible, for an excursion to Niagara Falls and the various electrical features to be seen at that place. An opportunity will also be afforded the party of visiting the various sub-stations in Buffalo. The closing meeting will probably be held on Saturday, August 24.

The plan outlined would seem an excellent one, and if carried out as now suggested will afford the members of the party a most enjoy-

able outing, at the same time furnishing them an opportunity to see the sights at Buffalo in connection with the Pan-American Exposition, to say nothing of the principal electrical undertakings of the country, to be met with in New York, Schenectady and Niagara Falls.

* * *

The Glasgow Exhibition and Trolley System.

While the Pan-American Exposition is attracting general attention on this side of the Atlantic the eyes of the British public are focused on the Glasgow Exhibition. Our London correspondent states that on April 25 a company of press representatives were allowed to view the exhibition, and the things there seen confirmed the opinion that from an electrical and machinery point of view the show will be an excellent one, far in advance of anything that has been held in that country for many years. The collection of machine tools, engines and dynamos is well worthy of mention, American apparatus especially being largely represented.

The day previous to the press visit to the Exhibition the first fifty-four miles of the much talked of Glasgow municipal electric trolley system was inaugurated with befitting ceremony.

The large generating station which contains the rival steam engines and the four 2,500 kw. three-phase generators (75 r.p.m., 6,500 volts) is not yet quite completed. The station was described by the consulting engineer Mr. H. F. Parshall, when speaking at the function as the finest power station in the world. The station equipment also comprised two 600-kw. 600 volt dynamos running at 90 revs. The electrical contract also included 160 100-kw. oil transformers to work at 25 cycles per second, 6 50-kw. 100 volt exciter dynamos running at 300 revs., and 24 rotary converters and boosters combined. The power station and its equipment have cost \$2,500,000 while the capital outlay on the whole undertaking including 31 miles more of double track (making a total of 75 miles) will eventually be over \$10,000,000.

This installation does not apparently come up in point of size and cost with the principal electric system in New York City, but it nevertheless is well worthy of note and is claimed by those who have inspected it to be a model of its kind.

* * *

The Crash in Wall Street.

Owing to a combination of local circumstances, and to the fact that the general public has of late gone mad on the subject of stock speculation, on Thursday, May 9, there occurred a panic on the New York Stock Exchange such as has not been witnessed for many years. The saying that "whatever goes up must come down" was forcibly demonstrated last week. Stocks that had never paid a dividend were quoted above par and values throughout the whole list were inflated, with the result that a fight by two millionaire interests to secure control of a certain railroad precipitated a crash that was bound to come sooner or later. During the time the panic lasted—some two hours—stocks dropped anywhere from ten to fifty points. General Electric opened at 220 and dropped to 200, and at the close of the day was quoted at 210. Brooklyn Rapid Transit, which opened at 76½, dropped to 68½, and finally came back to 72½. The local traction stocks

suffered severely, especially Manhattan, which went off from 120 to 83, closing at 109. Metropolitan sunk from 165½ to 150, and went back to 158. Western Union was no exception to the rule and dropped from 92 to 85, going back at the close of the market to 89.

The electrical securities referred to above suffered less than the railway shares, which in a number of cases showed a net loss at the closing of the market of from ten to twenty-five points.

It is to be hoped that a lesson has been learned and that the next year or two will see no more inflated markets or South Sea bubbles to be pricked.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

AN electric street car company has been organized in Merida, Yucatan, with an authorized capital stock of \$400,000.

THE board of naval officers, headed by Capt. Chadwick, appointed to make a full investigation and report on wireless telegraphy, has completed its work. The board reports on the entire feasibility of the system and recommends that it be adopted and that the present system of using carrier-pigeons for messages between naval points be abandoned.

CONSUL-GENERAL PATTERSON at Calcutta, India, in a report to the State Department, says that there may be an opportunity for our manufacturers of electrical machinery to secure the contract for the proposed electric plant to be constructed at Lahore, the capital of Punjab. Besides Lahore, which has a population of about 200,000, the cities of Madras, Delhi, Lucknow, Allahabad, Agra, Cawnpore and Benares, all in India, have no electric plants, with the exception of Madras, which has one for tramways, but not for lighting. The Consul-General says that electric lighting, though introduced into Calcutta only last year, is coming into general use.

MANY persons narrowly escaped death in an accident to a trolley car of the New York and New Jersey Traction Company at the village of Leonia, two miles from Englewood, N. J., last Sunday afternoon through the failure of the brakes on the car to operate properly. As many as twenty persons were hurt more or less seriously. The cars on this line which are unusually large are equipped with four motors and two brakes—an ordinary brake and a friction brake. Car No. 12, the one to which the accident occurred, got beyond the control of the motorman after leaving Leonia Heights and came down the steep hill into Leonia at a speed of probably thirty miles an hour. That the motorman made frantic efforts to stop the car is testified to by a representative of ELECTRICITY who was on the spot. As the car reached the sharp curve at the foot of the hill, the body of the vehicle tore itself loose from the trucks which jumped the track and fell violently on its side. This accident emphasizes most forcibly the need of careful and frequent inspection of the braking mechanism, especially on a road on which very steep grades are met with.

CONSUL GENERAL GUENTHER of Frankfurt, in a recent report to the State Department at

Washington, says that a Berlin engineer has constructed a trolley automobile line similar to that exhibited at the Paris Exposition, at Eberswalde, a small city near the German capital. In this system, continues the Consul-General, the automobile receives its motive power from an overhead wire by means of a trolley, which is connected with the automobile by a movable cable. This allows the vehicle to turn out at any place on the road. The Consul-General adds that the line has been favorably inspected by experts and that the system is expected to meet with general favor in Germany.

A BOHEMIAN farmer with the euphonious name of Michaelis Quentesky, located near New Egypt, N. J., is being sued by the Bordentown Trolley Company for the larceny of electric current. It seems that for some time, the trolley company has been wondering how it happens that it required a greater amount of electric current to run the Bordentown branch than it did to run any other road of similar length and grade in the country. After considerable investigation by electrical experts it was discovered that the ingenious Bohemian farmer referred to above had tapped one of the main feeders, and was utilizing the current thus obtained to stimulate the growth of certain crops on his farm. A perfect network of wire was discovered under a truck patch 300 feet long by 200 feet wide in which radishes were grown, which are claimed to have matured in nineteen days, whereas radishes grown under ordinary conditions, required six weeks. Apparently the question for the judge to decide is, what number of amperes of current equals one month's natural growth of a radish in a sandy soil?

CONSUL JONES of Funchal, the seaport of the Madeira Islands, says that the Eastern Telegraph Company has finished laying a cable from Falmouth to St. Vincent, Cape Verde Islands. It passes through the office of the Western Telegraph Company, limited, at Funchal, and is worked in connection with the Cape-St. Helena route. The latter company has landed four cables at Funchal—two to Lisbon and two to St. Vincent. One of the Lisbon cables is continued to Brazil, and connects that country with Europe. The direct cable route from Funchal to the United States, adds the Consul, is via Lisbon and the Azores. The tariff to New York is about fifty cents a word.

THE Municipal Council of Leeds, one of the most prosperous manufacturing cities in England, is considering the expenditure of some \$2,500,000 for the purpose of electric lighting. The Council's scheme includes the extension of the present works, the installation of engines and dynamos, the introduction of a new plant and the laying of mains in various parts of the city. During the last two years some \$700,000 was expended by the city authorities for machinery, etc., contracts for a fair portion of which went indirectly to manufacturers in the United States. American firms interested should address Mr. Dickenson, manager of the Leeds Corporation electric lighting plant, Leeds, Yorkshire, England.

A REPORT from Brussels states that the Central African Telegraph Line connecting Brazzaville with Loango, on the west coast, has been completed, and that direct communication

tion with Libreville may be had from any station of the English-Atlantic cable. The cable from Brazzaville to Stanley Pool, which is being laid to connect with the telegraph system of the Congo State, will ultimately be extended to Lake Tanganyika, where it will form a conjunction with the German East African system.

REPORTS received from the various committees, which have in hand the perfecting of arrangements for the annual convention of the Canadian Electrical Association, to be held at Ottawa, are of a most satisfactory character. An excellent list of papers has been secured. Interesting reports will be presented by special committees appointed at last year's meeting to consider certain matters affecting the welfare of the electrical companies. The constitution of the association has been carefully revised and improved in many points and rendered more workable. The local committees are exerting themselves to the utmost to give to the convention an interesting, enjoyable and profitable time. A satisfactory attendance of the members is now the only requirement for the success of the meeting. The dates selected for the convention are the 19th, 20th and 21st of June, the most enjoyable season of the year, when most people are looking forward to an outing. All of the conditions are therefore favorable to a large gathering of electric men at the Canadian capital.

RECENT experiments in wireless telegraphy off the coast of Malta have resulted in the successful transmission of a message 134 miles, according to United States Consul Grout at Malta, in a report to the State Department. The message was received in an unexpected way. While experimenting on a ship in the open sea, the Consul says, the operators were surprised to receive a message in Italian asking as to the position of their ship. It afterward developed that the message came from an Italian war vessel at Syracuse.

WHAT is truly a record feat in wireless telegraphic communication, certainly so far as the navy is concerned, says the London "Electrical Engineer," was obtained a few days back when a message was received on board the Hecator at Portsmouth from the naval authorities at Portland. The distance at which the information was taken off was 103 miles as the crow flies, and this new achievement is regarded as exceedingly gratifying. Previously to this, messages had also been received on board the Hecator from the Majestic, some 90 miles away.

DURING the past ten years many inventions have been heralded throughout the country threatening to drive the telegraph operator out of business. Up to this time none of them have succeeded in doing so. The key which transmits the Morse signals to-day is practically the same used by Thomas A. Edison, Andrew Carnegie and other telegraphers thirty years ago. The twentieth century telegraph key, designed by a prominent official in one of the large telegraph companies, is intended to increase the speed of the operator, and to prevent telegraphers' paralysis. It is a radical departure from the one now in use. It consists of a handle that may be grasped by the whole hand or operated by the touch of any finger or part of the hand. It is unnecessary to retain a firm hold upon this handle, and the

fingers may be shifted as desired during transmission. It can be turned completely around at will, so that any desired position may be secured instantly. It is the cramped position of the fingers on the familiar key-knob that causes paralysis of the operator's wrist, or at least great distress. This instrument has been in use on the "Journal-Examiner" leased wire, working direct from New York to San Francisco, a distance of 3,500 miles, a speed of 3,000 words an hour being maintained.

CHARLES BLETTERMAN ELLIOTT, the retiring general manager of the Cape Government Railways, has been appointed a Commissioner to tour in England, Continental Europe, and the United States, for the purpose of inquiring as to the best systems of electric lighting, carriages, and other railway construction with a view to extensions. He is empowered to order material and rolling stock for the construction of the new light railways.

IN the course of an article reviewing the possibilities of the accumulator for boat propulsion from a commercial point of view, Mr. E. W. Ehnert, in the "Elektrotechnische Anzeiger," makes some interesting comparisons between the respective merits of steam and electric propulsion. Apart from the superior cleanliness and decreased vibration obtained with the latter, the writer points out that the commercial possibilities of the accumulators for the purpose in question depends upon the employment of the boat. As regards the annual cost of maintaining a boat in constant service, the advantage rests undoubtedly with electric propulsion—for instance, when the vessel is required for police duties in a harbor, or is a pilot boat. Such boats must be kept in a state of constant readiness for service, which, when steam propulsion is used, means a constant expenditure of fuel, while an electric boat consumes no energy when stationary. Experience, further observes the writer, with accumulator boats points to the advisability of employing Planté-formed plates, despite their greater cost and weight, as compared with paste plates.

GERMAN invention has given electric eye glasses to the world. They are claimed to restore dimmed or darkened vision. The glasses are about the same size as an ordinary pair of spectacles, but the frame is made of thin layers of copper and zinc. These metal sides are moistened with some dilute acid, and an electric current is thus caused to flow through the eye nerves, resulting in better vision.

IN Sweden in future all the principal railway trains will carry a telephone apparatus which may be connected with the telegraph wires, and thus communication be established with the nearest station. The arrangement is, of course, invaluable in case of accident. The apparatus is set in working by the coupling of one telephone wire on to the telegraph line and another to the rails.

A VERY peculiar system of electric traction, the invention of two young Belgian electricians, is now being tested at the works of M. Jules Dulait, says the "Engineer and Iron Trades' Advertiser," of Glasgow. In this system the line itself is practically the stator of a

gigantic three-phase motor, whilst the moving car is fitted up as the rotor of the motor. In short, if the stator of a three-phase motor was opened out straight it would represent the track on the new system, whilst a section of rotor would represent the moving car. The three-phase currents in the line form a traveling magnetic field. At the same time currents are induced in the windings carried on the car, just as they would be in the windings of a rotor, and the attraction between these currents and the traveling magnetic field provides the necessary tractive force. It will be seen that, as no current enters the car from the line, no form of trolley is needed, and in no portion of the system save in the generating stations themselves is there moving machinery. The inventors expect to obtain good results in working high-speed traffic, but admit that it is quite unsuitable for trains running at speeds of 20 miles an hour or so. It is obvious that before making their system a commercial success, the inventors will have to solve many mechanical and electrical problems.

A COMMITTEE of experts appointed by Postmaster General Smith to investigate the workings of the pneumatic tube system of carrying mails in cities has reported its conclusions that on the present basis of cost the system is too expensive. The committee declares, however, that a system to be operated by electricity is in process of development, which bids fair to be successful. Essentially, the system is simply a three-rail trolley road, operated in a tube. The tracks would be laid, insulated, and bonded before the top was fastened down. The carriers would be built with slightly rounded corners, so as to conform to the turns made at street corners. The carriers and their motors would be operated between guides. By cutting the tracks and the introduction of a system of looping, well understood by electrical engineers, the speed of the carriers would be lessened at corners and also when approaching stations.

A PROBLEM will confront General Greely, Chief Signal Officer, when he invades the Philippine archipelago in July. His force of officers will be cut in twain at that time, and his struggle will be, after inspecting the situation with his own eyes, to map out the remaining work of the Signal Corps so that fifteen officers can perform the duties hitherto distributed among thirty. The red lines on the latest military map show a system of land wires and submarine cables stretching between extremes about a thousand miles apart, but so ramified as to compose a total length of between 4,200 and 4,300 miles, or enough to make a line from San Francisco to New York and back to Chicago. Over this system there passes an average of 10,000 Government messages a day, these messages averaging at least 100 words, so that in round numbers, it may be said that 1,000,000 words are transmitted daily by telegraph on Government business. This is almost a necessity of the situation, in view of the absence of any proper facilities. It is the only efficient means of communication between the military and other functionaries of the Government. The abundant use of the wire, indeed, has given rise to a witticism by one of the signal officers, speaking of his army brethren at a certain headquarters: "They never send any dispatches; they merely file letters."

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 27.

THE DIFFERENCE IN "GROUND" POTENTIAL.

To illustrate more clearly what is meant by the above phrase, let me explain by supposing that the earth constitutes a conductor over which a current is flowing. If there were positively no resistance in the ground then there would be no difference of potential in the electric current flowing through it and consequently there would be no difference in potential between any two points of the earth which comprised this circuit. This is not the case, however, and a resistance does actually exist in the earth to a flow of current causing a potential difference between the two points which constitute each end of the circuit and also between any two points effected by that current. The idea can be very well illustrated by permitting a current to flow over a bare copper wire and then by the use of a mill-voltmeter noting the voltage between any two points on the wire. The volts or fraction of a volt indicated by the instrument will represent the potential difference between the two points to which it is connected.

If a current is passing through a resistance coil and a reading be taken with a voltmeter connected across the two terminals of the coil a certain voltage will be indicated which will represent the difference of potential or voltage between those two points of the circuit. This difference is of course caused by the fact that a resistance exists in the circuit and to the flow of current. If no resistance existed there would be positively no difference in the electrical pressure between the two points. Now applying these illustrations to earth circuits the same governing influences come into effect. The ground offers a resistance to the flow of an electric current depending on certain conditions of conductivity. When this resistance exists then a difference in the potential of the flow of current must also exist. If the ground were only used as a return for some one circuit, this resistance offered by it would be of no particular consequence because it could be effective only in relation to that one circuit, but this is not the case, as the earth is used as the one side, or return, for innumerable circuits of all kinds.

Potential actually means power of doing work, so that if there is a difference of potential between any two points it simply means that there is a difference in the power of doing work of the electric current. This difference in power of doing work is a result of work having been performed. The fact that a resistance to the flow of current through the earth exists causes the current to do work in overcoming that resistance, and the fact that the current performs work causes it to be reduced in its power of doing work, which gives us what we know as a difference of potential between two points in the earth, or what is often termed a potential difference between two "grounds."

If a difference exists in the power which an electric current has for doing work it must be because some work has been done, and so long as there is a resistance to a flow of current work must be done in overcoming that resistance. The work done by electric currents passing through the ground, in what is known as return ground circuits, is varied and depends entirely on the influencing conditions and the amount of current flowing. Some of the work performed may be the production of heat, the decomposition of water, the electrolytic deposition of metals, and the decomposition or eating away of metals, generally known as electrolysis or electrolytic action. It would be almost impossible to enumerate the different kinds of work performed by earth currents in endeavoring to reach their low potential pole.

The difference of ground potential and its effects is only noticeable to any great extent in towns and cities, and there the effects are often disastrous to water mains gas pipes, etc. The effect produced by these conditions is commonly known as electrolysis and did not enter into any degree of prominence in engineering until after the introduction of the electric street railway with its return ground circuits and heavy currents. Usually railway power plants are connected with the positive pole of their current fed to the overhead conductors, while a return is provided by the conductivity of the rails, supplemented by heavy copper cables connected at frequent intervals to the rails, which in turn are bonded together by connecting links of wire to insure good conductive qualities at the connecting joints. It would appear as though the current would follow the rails and copper cables in its return rather than leaking to ground and causing electrolysis. This of course is true as far as the major portion of the current is concerned, provided proper construction exists relative to the carrying capacity required, but it must be remembered that any circuit offers a resistance to a flow of current to a greater or less degree, and if a parallel circuit is provided or exists then the amount of current which will travel over this parallel conductor is in proportion to the relative resistance between the two.

Understand then that the earth is a parallel conductor to a return ground, when a return is provided other than the earth circuit, so long as the return is grounded; in fact, the earth circuit comprises a part of the entire circuit and as a result must be effected by the current, and if the conditions are favorable electrolysis will result.

The most disastrous effects as a result of this condition are generally caused by points of high resistance in the provided return, such as corroded joints, broken bonds, etc.

I have heard of several engineers reversing the direction of the current, that is, connecting the positive pole to the ground, as a preventative of electrolytic action, but I fail to see first how the direction in which the current flows through the earth would make any difference, and as a matter of fact, it does not.

Not only is the flow of current through the ground caused by street railway operations, but also by numerous commercial circuits, telephone, telegraph and some systems of electric light, although on account of the amount of current used by street railway operation most of the electrolytic results are attributed to that cause. The effects of this besides re-

sulting in electrolysis, also interferes with the operation of telephone and telegraph systems where ground circuits are used, and many varied and ingenious devices and circuits are provided overcoming or counteracting the effect of the difference of potential.

Article No. 28 will be entitled "The Electrolytic Deposition of Metals."

THE SOLDERING OF ALUMINUM.*

During the past few months there has been a regular revival of interest in the soldering of aluminum, and many of the papers have been busily engaged in discovering and describing novelties which are several years old, while others have been carefully giving a wrong or imperfect explanation as to why aluminum is so difficult to solder with perfect success. Although we do not by any means intend to imply that aluminum can ever be soldered with the ease and dispatch with which that operation is conducted on brass, galvanized and tinned iron, yet the metal is capable of being united by the bit somewhat more readily than most people seem to imagine, provided a proper kind of solder is employed in the proper kind of way. There are two totally distinct obstacles to be overcome before a satisfactory joint in sheet aluminum can be made by soldering. The first is to find and use some material which will be permanent in damp air, water, etc., when it is in good electrical contact with so electro-positive a metal as aluminum; the second is to apply that material to a metal like aluminum, which is always covered with so closely adhering and rapidly growing a film of oxide. Now, it is clear that the stability of the soldered joint on exposure will depend entirely on the composition of the solder adopted; but the ease of application of that solder will depend partly on its own composition, and partly on the initial preparation of the aluminum surface.

To make a valuable solder, then, four points have to be considered. It must be composed of some metal or alloy which fuses at a low temperature, so that it shall flow smoothly from a copper, nickel, or aluminum soldering bit. It must not oxidize appreciably nor segregate when heated to its melting point on the bit. It must, as a whole, be as electro-positive as possible, so that it may not be capable of forming with the aluminum object to which it is applied a galvanic couple of sensible voltage. The fourth requirement concerns the aluminum surface itself; it must be cleaned from its film of oxide either by mechanical or chemical agency during the act of soldering, that is to say, while the metal is protected (if possible) by the molten solder from the surrounding atmosphere. The selection of a metal or of several metals to form an alloy of any desired melting point is not a matter of great difficulty. Many such compositions have been used for soldering other metals for generations; there is no particular trouble in finding something to match the peculiar shade of white exhibited by commercial grades of Héroult aluminum so that the joint may not be conspicuous to the eye. The question of galvanic action between a metal and its solder, on the other hand, has scarcely ever been of much practical importance hitherto: and our practical metal workers are rather apt to over-

*From the "Electrical Review," London.

look or ignore the necessity for investigating the matter now that aluminum has become of industrial significance. This is only natural; for with due skill the coating of oxide on aluminum can be removed, and almost any well-known solder stuck on to the metal, thus forming a joint which for an hour, day, or week appears perfect, has perhaps greater mechanical strength than the aluminum itself, and conclusively demonstrates to the happy inventor that he has discovered another "fortune." In a month or so, maybe, the joint fails, either the aluminum or the solder crumbling to pieces, and then the experiments have to begin again in the previous haphazard fashion.

By consulting almost any of the text-books a list of metals arranged in galvanic series can be drawn up or met with, and if the book be not too old the position of aluminum in relation to other metals suitable for the preparation of a low temperature solder can be studied. Unfortunately, the tables given by our authorities are generally based on the behavior of metals when exposed to certain laboratory acids, alkalies, and salts, and not to the damp air or weak aqueous carbonic acid of everyday life. For this reason the data must be used with caution, as the series vary somewhat in order according to the nature of the electrolyte selected. Indeed, it seems possible that in this variation may be discovered one of the reasons—completely inevitable so far as it goes—for the occasional failure of aluminum, soldered or not, during exposure. Under oxidizing influences aluminum closely resembles the metals of the alkalies and alkaline earths, being much less permanent than manganese, zinc, iron, etc.; under chlorinating influences aluminum resembles the last three metals, and is much more stable than sodium, calcium and magnesium. Thus if any neighbor for aluminum be chosen to avoid galvanic action under the attack of, say, hydrochloric acid—for which purpose manganese and zinc are indicated—that neighbor will be too negative when oxygen is the corroding agent. And, per contra, such a metal as magnesium, which lies nearest to aluminum when oxygen is the enemy, is highly positive when chlorine appears on the scene. However, it will be found that, roughly speaking, and in this particular of galvanic action alone, zinc is the best metal of which to make a solder for aluminum; then lead, and finally tin. The best of all is, of course, aluminum itself; but to solder aluminum with aluminum is to "burn" the metal, in the language of the plumber, and that is different from what is understood as soft-soldering. Nevertheless, there is no objection, and, indeed, there is much advantage, in having a certain proportion of aluminum in the solder which is to be used with the bit.

Turning now to the problem of removing the film of oxide from the surface of the metal before soldering; we are met by the practical difficulty that the obvious agent, hydrochloric acid or something similar, is far from being perfect, or even satisfactory; for although it readily dissolves the alumina, before the solder can be applied the acid becomes neutralized by the excess of metal, the aluminum chloride seems to be ineffective in protecting the surface, and a fresh coating of oxide forms instantaneously. To meet this objection it is possible either to clean the metal mechanically underneath the layer of liquefied solder in the act of soldering, by filing, rubbing, or scratch-

brushing and the like, or to incorporate into the solder some substance which is competent to decompose, remove, or dissolve the oxide. Methods for effecting this mechanically in the manner indicated, have frequently been suggested and patented, and we believe in skillful hands they all work more or less satisfactorily. A wire brush seems the most natural thing to use, but it is only available where the joint is on fairly stout metal and in an accessible situation. An idea for decomposing the oxide chemically has been patented lately by E. M. Totten, of Buffalo, and is being "boomed" considerably in the press at the present moment. According to the published descriptions of this process, the solder consists of aluminum, 20 per cent.; tin, 30 per cent.; zinc, 40 per cent.; a "hydrocarbon," 2 per cent.; and 8 per cent. of some unmentioned constituent. The "hydrocarbon" is to be fat or wax (these are not hydrocarbons, but no matter), paraffin, etc., and it is claimed to "increase the amount of carbon" contained in the solder, which carbon reduces the film of oxide (alumina) during the operation of soldering, and renders the scraping of the metal unnecessary. This claim is extremely interesting and instructive, because it has been known to students of electrochemistry for many years, ever since the advent of the Cowles method of making aluminum bronze—and, indeed, before that time—that alumina cannot be reduced by carbon except at the temperature of the electric furnace, so that even if Mr. Totten's process actually does what it is represented to do, the carbon in the solder plays no chemical part in cleaning the metal.

Dr. Richards' solder for aluminum, which has just been discovered by several English papers, has been in existence for eight years. It was patented in Great Britain under the name of W. A. Briggs, on November 9, 1892 (No. 20,208). The active ingredient for removing the oxide is phosphorous, and according to the specification, the solder is prepared by mixing 32 parts of tin with 1 of phosphor-tin containing 5 per cent. of phosphorous, then adding 1 part of aluminum, previously melted with 8 parts of zinc. It was also stated in the English patent that the melting point of the solder might be lowered by increasing the percentage of tin, while its mechanical strength could be improved by raising the proportion of aluminum and zinc. Further experience with the material has shown, however, that the normal composition, as given by the formula of the specification, tends to liquefy when melted a second or third time; and so the solder is now composed of aluminum, 1 part; phosphor-tin, 1 part; zinc, 11 parts, and tin, 20 parts. It is used much in the usual way with a copper or nickel bit; but the aluminum requires to be first "tinned" (i.e., coated with the solder as is done in soldering copper or sheet-iron), before the two pieces which have to be united are brought together. No flux is employed either on the bit or on the sheets, as the contained phosphorous effects the cleaning necessary. This solder has been adopted largely in America, and yields results probably as good as can be expected with aluminum; it has also been recommended by the authorities of the Neuhausen Aluminum Works. It is known to be permanent for over three years, to be as strong as, or stronger than, the aluminum itself, to be reasonably cheap, to have a color matching well with the rest of the object, but to darken slightly after the lapse of time.

REGULATION OF MOTORS.*

A shunt-wound motor automatically maintains a constant speed under all variations of load, up to its full capacity, due to the following facts:

First—When the armature is revolving between the poles of its field magnets, the wires in the armature which give it polarity are dragged through the magnetic field in which the armature turns, and, of course, have a current generated in them, but in the opposite direction to the current which produces the magnetism which causes rotation, in accordance with Lenz's law, which says that "the movement of a conductor in a magnetic field induces a current that resists the original current which produced that motion," or, in other words, the direction of induced currents is always such as to oppose the motions by which such currents are produced.

This induction gives rise to what is known as counter electromotive force (EMF.), and is apparent in all types of electric motors.

There are three separate EMF.'s to be considered in this connection, as follows: First, the impressed electromotive force, or that supplied by the generator to the motor; second, the counter electromotive force, the difference between the counter and the impressed, and it is this which really accomplishes the work.

It is obvious that the faster the armature revolves, the greater will be the counter electromotive force.

This counter current flows no further than the brushes, or rather does not flow at all, but really maintains a balance between itself and a certain amount of the impressed, the difference represented in effective current acting reciprocally with the field magnets, and producing the rotary effect of the machine.

Theoretically, if a dynamo generating an EMF. of 100 volts at 2,000 revolutions per minute, be connected by wires with a motor of the same size, which requires 100 volts to drive it at a speed of 2,000 revolutions per minute, and there be no load on the motor, there will be practically no current consumed by the motor, and none generated by the dynamo; for it, i.e., the motor, will generate a counter EMF. of 100 volts, which, opposing the impressed EMF. of 100, will balance it, with the result that both machines will run at the same speed without the flow of any current.

As a matter of fact, some current does pass through the motor, namely, that necessary to magnetize its field magnets, and that required to overcome the inertia of the armature, friction of bearings, brushes, etc.

If we place a load upon this motor, the speed will be slightly decreased, perhaps only a very few revolutions, but sufficiently to reduce the counter EMF. This will naturally cause an increase in the effective EMF., for the "counter" diminishing, the "impressed" will force more current into the armature, thereby magnetizing it more, while the fields retain approximately their same strength, the tendency to rotate, torque or pulling power of the armature is increased just in proportion to the increased load, and the speed remains practically the same.

Should the load be suddenly thrown off, instead of racing or running away, the speed of the armature increases a few revolutions until the counter EMF. rises to its original strength,

*From the "National Engineer."

when it is maintained constant. Thus it will be seen that, under varying loads, the speed of a shunt-wound motor will be practically constant.

A series-wound motor, however, does not maintain a constant speed under variations of load, because the counter EMF., in opposing the impressed, tends to keep back the current from the fields to such an extent that they become weak, and the speed of the armature without load is almost unlimited, and while its starting effort or torque, under load, exceeds that of the shunt, it will not maintain a constant speed, but one which will always vary, depending upon the amount of work it is doing.

It is better to run a motor of large horsepower on a small load, than to use a motor of small horse-power and load it to its full capacity, because the larger the motor in proportion to the work, the less it will be obliged to accomplish per revolution, and the nearer will

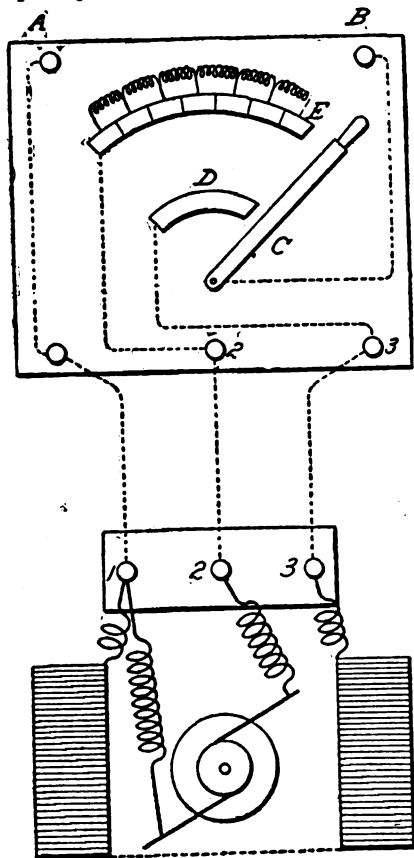


FIG. 1.

the counter current approximate the impressed, and the resulting effective current will be comparatively small. So, if we have 3 hp. of work to do, it will be better to employ a 5 hp. motor than a 3 hp. motor, although, of course, the rule will not hold good indefinitely; for example, it would not be economical to use a 10 hp. motor to do 1 hp. of work.

When a motor is running without any load the back EMF. is so great that it allows little current to pass into the armature. As the load is increased, the speed is cut down, which reduces the back EMF. and allows a greater current to pass through the armature. This makes it a stronger electro-magnet, thereby making its torque greater, and it is better fitted to dispose of the extra work which it is called upon to perform.

Current must not be admitted to an armature from a dynamo, but must first be admitted to the fields, and after they have been magnetized sufficiently it is let into the armature by degrees.

If the whole current were allowed to go into the armature at first, it would burn it out before the current could go through the greater resistance of the field magnets and make a strong enough field to cause the armature to

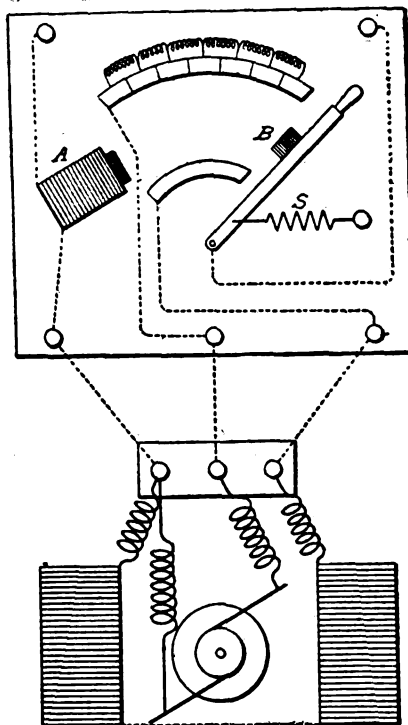


FIG. 2.

rotate at sufficient speed to develop a counter electromotive force to reduce the current.

Motors are generally furnished with a rheostat, to be used in connection with them. The rheostat has two binding posts on top, Fig. 1, A and B, which are connected to the mains. There are generally three on the bottom of the rheostat. No. 1 is connected to one field coil and to one brush of the armature. No. 2 is connected to the other brush. No. 3 is connected to the other field coil.

When it is desired to start the motor, the arm of the rheostat, C, is moved far enough to touch the metal strip, D, but not far enough to cut in any of the rheostat coils. The current then passes in from one of the mains, goes through the field magnets, and out through the strip, D, and the arm, C, to the other main. The field magnets are thus energized before any current is allowed to go into the armature.

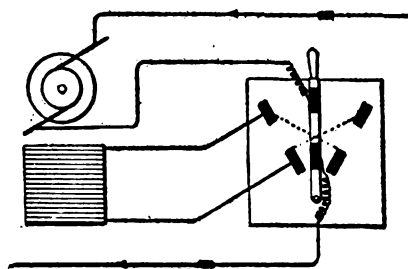


FIG. 3.

The arm is then moved until it touches the first disk, E, connected with the resistance coils, and the current has not only the path through the field magnets, but it can also go from one main through the arm, C, and all the resistance coils, then through the armature and back to the other main. Thus a very small current is allowed to go into the armature at first.

As the arm, C, is moved toward the left, more and more of the resistance is cut out, and more current is allowed to enter the armature,

until the arm reaches the last disk on the left, and all the resistance of the rheostat is cut out, as the armature by that time has developed a speed sufficient to cause enough back electro-motive force to keep the large current from harming it.

The head board of the motor generally has three binding posts, connected as shown in the sketch, which can be connected directly to the three on the rheostat.

Before the invention of the automatic switch, it was not as uncommon an occurrence to have the central station in a town shut down without warning, when probably a large number of elevators were being operated by electric motors, of from 5 to 10 hp. Of course, the motors will stop, but without the automatic starting boxes, the lever, C, Fig. 1 was left clear on, and the armature formed when standing still practically a short circuit on the line, and when the station, without warning, again threw the current into the line, the almost invariable result would be a burnt out armature. Occasionally, it is true, the safety fuses would melt first, but in the majority of cases the armature would go.

While the customer was in no way to blame for the burning out of his motor, he had no redress, and had to calmly pay for rewinding, which, in the large machines, amounted to considerable.

From this it will be seen that it is absolutely necessary to have an automatic device which will cut out the motor entirely when the cur-

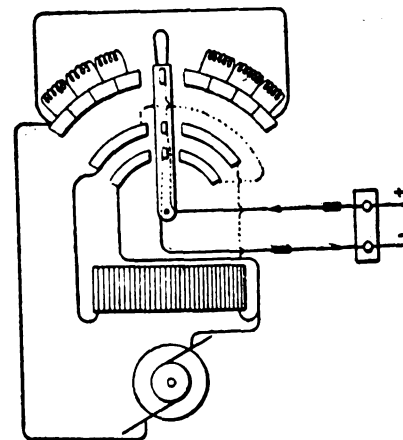


FIG. 4.

rent is shut off, in order that when it is turned on again that the entire current will not go through the armature at once and burn it out. In these cases an electro-magnet, Fig. 2, A, is connected with the main line wire in the rheostat, and a small piece of soft iron, B, is carried by the rheostat arm.

When the arm has been removed to the last disk, the entire current is passing through the electro-magnet, which attracts and holds the arm by means of the piece of the soft iron, against the tension of the spring, S. If the current is shut off from the mains, the electro-magnet will lose its magnetism, the piece of soft iron will be no longer attracted and the spring will pull the rheostat arm back until the motor is cut out entirely. When the current starts up again, the motor is started in the usual way by hand.

It is evident from the foregoing, that the automatic switch box will immediately and effectually cut out the motor the moment the current supply fails. In order to reverse the direction of rotation of a motor armature, it is not sufficient to reverse the direction of current in the machine, but it

must be changed in either the armature or field magnets, without changing it in the other. To do this, as it is frequently required in connection with motors used for lathes or for elevators, special switches have been designed, in which the current in the field magnet is reversed by moving a lever forward or backward. It is much easier to reverse the field coils than the armature, because they only require about one-twentieth as much current and consequently the sparking will be much less.

Figs. 3 and 4 show two types of reversing switches. The first adapted to series motors, which require no resistance in the armature, and the second for use on shunt motors, showing resistance in armature circuit while starting the machine.

Various arrangements have been devised for the purpose of starting and operating motors at certain predetermined speeds without the use of rheostats. This is accomplished by placing the two field coils in series with each other, and in series with armature, then placing the two field coils in multiple with each other, and in series with the armature, and lastly by placing both coils and armature in multiple with each other and the line.

Motors from 1-16th hp. to $\frac{1}{2}$ hp. are not usually provided with starting rheostats, because their armatures are so comparatively light, and their inertia so small, that they spring quickly into motion immediately upon the passage of the current, and develop a counter electromotive force, sufficient to keep back an injurious current before the impressed has had time to do any damage.

This is not the case, however, in motors from $\frac{1}{2}$ hp. and upwards. Their armatures being heavy, they start slowly owing to their large inertia, and an excessively injurious current would enter before they could develop a sufficient counter E.M.F. to prevent it, were it not for the fact that in machines of this size rheostats are always used in connection with the armature circuit, the object being to first powerfully and fully magnetize the fields, and then to slowly admit current to the armature.

An ingenious method for governing the speed of motors is employed in the Excelsior machine when on series arc light circuits. The shaft carries a regular ball governor, such as is used on steam engines, but the connecting rod, instead of cutting on or off steam, moves a brush backward or forward over a straight commutating switch, thereby cutting in or out more or less field coils, which controls the speed by producing the proper intensity in the field, and maintaining its relation to the armature, whose intensity does not change at the degree necessary to do the required work.

Some Carbide Statistics

The amount of calcium carbide imported into Germany during the year 1900 was 7,681 metric tons, and the export 224 tons, says the "Electrical Review," London. In the previous year the corresponding figures were 6,374 tons and 636 tons. Estimating the quantity of carbide manufactured within the bounds of the empire at 2,500 tons in both years. The total German consumption for 1899 is seen to have been 8,238 tons, and for 1900 10,180 tons. Of the exports, 86 tons in 1899, and 26 tons in 1900, was sent to Australia. These latter are not very large figures, and they are fortunately decreasing; but they ought to disappear altogether, and the carbide required in the Commonwealth be either made locally or exported from Great Britain.

ELECTRIC MOTORS—A BRIEF OUTLINE OF THEIR CHARACTERISTICS.*

BY A. SAUNDERS MORRIS, M.E.

To the layman and to many engineers whose work has not led them to investigate electrical subjects, the electric motor is unknown in respect to its characteristics and its application to the work to be performed. That is, if the variations of torque and speed are known, it is in many cases possible to so design a motor that it will take care of these variations automatically. For instance, a motor may be so designed that with increasing load it will run with increasing speed, or that it will maintain a constant speed, or that it will decrease its speed as the load increases.

To many the motor is simply a machine for the conversion of energy, and in general, electric manufacturers are not sufficiently informed as to the conditions of torque and speed required. In many cases this lack of information comes from the fact that the motor is to be applied to an individual tool whose characteristics of torque and speed are not well-known—chiefly on account of the difficulty of making power measurements. Usually the manufacturer of the tool states that, say, a four-inch belt will drive it running at so many hundred feet per minute, and somebody is left to do the guessing. In a certain case which came under the writer's notice, a 10 hp. motor was specified for a tool. After the motors were installed it was found that they only required 3 hp. to run them, but it was stated that they required 10 hp. to start them.

A further investigation showed that these statements were based on current readings, the current when running being, say, 12 amperes at 220 volts, and when starting being, say, 40 amperes. The actual voltage on the motor was forgotten, but was probably not more than one-quarter of 220, and the actual horse power on the motor shaft was relatively small. To use the analogy of the steam engine, and suppose we had some instrument which we could put into the steam pipe to determine the steam consumption—if we assume that 20 pounds of steam per horse power per hour represents a fair consumption, would we be surprised if on starting we used six times as much per horse power, even with the cylinder hot? A steam engineer under these circumstances would not install a 15 hp. engine or even a 10.

Modern electric motors may be divided into two general classes—those operated by direct current and those by alternating currents. The subdivisions of direct current motors are in the main two only, viz., shunt, for constant speed, and series wound for variable speed. There may be, however, numerous combinations of the two types of field windings given, forming a very important sub-class called compound-wound motors.

Alternating motors of the polyphase type, whether for two-phase or three-phase, have the same general characteristics, the number of phases being taken care of in the design of the motor, as they do not materially affect the motor so far as its characteristics are concerned.

Polyphase, like direct current motors, may be divided into two general classes, namely, those for constant and those for variable speed. The range of speed in alternating motors is not as great as in direct current motors, for the reason that an alternating current mo-

tor will not run faster than synchronous speed, even when lightly loaded. By synchronous speed is meant the number of alternations of the circuit divided by the number of poles of the motor. In this sense, then, the alternating motor is not so flexible as the direct current motor. Alternating motors may be designed to run within 5 per cent. of synchronous speed, or by changing the proportions may be made to drop materially from synchronous speed.

Having now firmly fixed in our minds the idea that with direct current motors we should use a shunt-wound motor where constant speed and variable torque are required, and the series wound where the speed and torque are variable, let us see how this works in actual practice. Suppose, for instance, the motor is to be applied to some machine tool such as a lathe or boring mill—is a variable or constant speed motor required? The speed should manifestly be constant when referred to the load, i.e., should vary but slightly whether the load be thrown on or off, but should be variable at the will of the operator. Assuming, then, that the motor is coupled to a constant speed tool without the use of cone pulleys or other variable speed mechanism, the shunt-wound motor is the proper one to select, but the specifications should be drawn to provide for a change in speed of the motor over a given range. This adds to the expense of the motor over that of one running at a constant speed, and often unnecessarily so, on account of the uncertainty of the torque required, particularly at the lower speeds. For example, many engineers specify a 10 hp. motor having a range of speed of 400 to 800 r.p.m. The manufacturer is left to judge (and usually without knowing the use to be made of the motor) whether 10 hp. at 400 or at 800 r.p.m. if wanted, or both. If the motor should be applied to a lathe, for instance, it might be called on for 10 hp. at the slowest speed, say, on steel; and at the highest speed, say, on brass, only 5 hp. would be required. On the other hand, suppose the motor to be applied to a pump pumping against a constant pressure, it is then manifest that if the pump required 10 hp. when the motor was operating at 800 r.p.m., it would not require much more than 5 hp., when running at half speed. If the motor manufacturer furnishes a motor in this case capable of giving 10 hp. at 400, the expense is unnecessarily great and the pump is over-motored. Wide ranges of speed may be obtained from shunt-wound motors in various ways, such as, for instance, by supplying the armatures of the motors from two or more voltages, and in other ways also, but these are beyond the scope of this article.

Passing now to the series wound motor and disregarding its use for traction purposes, its chief use is for cranes and general hoisting work or work of a similar character, where this motor is always in the hands of an operator who can control its speed. The speed characteristic of the series-wound motor is almost the reverse of the shunt-wound—that is, when exerting its maximum torque its speed is least, and when the effort is least, its speed may reach a dangerous point.

There are cases where a series-wound motor may be used to good advantage where the motor is not under the constant control of the operator. One of these cases came to the writer's notice some time ago, and the sequel is instructive. A series-wound motor of 4 hp.

*From "Stevens Institute Indicator."

capacity was driving a punch. The selection of a series-wound motor of this capacity for the purpose was a good one as it started the punch with a less expenditure of current than a shunt-wound motor would have done, and when the punch was actually doing work and slowed down slightly, the increased torque was there to help the punch through. This motor was, however, wanted for something else and was taken off the punch. A much larger series-wound motor was however available, and as the small one had been doing so well, they assumed that the large one would do as well or better. When the punch had been started, the torque required was too little, the motor ran away and much time was spent in endeavoring to convince unwilling ears that the motor was not to blame.

Having now noted that the shunt-wound motor with a constant field gives us approximately a constant speed with variable torque, and that a series-wound motor with its field depending on the torque gives a variable speed, we may consider the combination of the two, i. e., the compound-wound motor. It should be noted here that to secure an absolutely constant speed the resultant field should remain constant, the torque varying. To do this, as the torque increases the field should be weakened either by throwing in resistance, or automatically, by taking a few turns of wire around the field in series with the armature, and so arranged that the current flows in the opposite direction to that in the shunt winding. The ordinary regulation of shunt motors is generally considered close enough for all general practice, but closer regulation may be secured if necessary, although with some objectionable electrical features.

The most important use of the compound-wound motor is where a very heavy starting torque is required and where close speed regulation is not demanded, or where occasionally heavy demands are made on the motor. As an example of the first case a pump might be cited, and as an example of the second case, punches, shears, or bending rolls might be mentioned. In these cases it is customary to give the motor just enough shunt winding to prevent its attaining a dangerous speed when the entire load is thrown off. In some cases a controller is furnished with a compound-wound motor which varies the number of series turns in the field. Such a motor can only be used where actual speed does not much matter, or where the torque required remains constant, as for rotating kilns for cement works.

For driving a pump, a compound motor possesses the desirable feature of giving a strong starting torque with the least draught of current on the system, and this is particularly true where there is a large amount of water, the inertia of which should be overcome slowly. Compound-wound motors offer a very attractive field for meeting varying speed conditions by inherent speed regulation, but some caution should be exercised in their use, and the speed and torque required at various loads should be accurately given.

Another method of securing efficient speed control is worth at least a passing reference on account of its importance in traction work, namely, the series parallel. For traction purposes this is accomplished by throwing, for slow speed, two motors or multiples of two motors, in series, and in parallel for high speeds. These are of course series wound mo-

tors, but the same thing may be accomplished with two shunt motors, except that in this case the armatures only are thrown in series, or an equivalent result may be attained by the use of one motor with two commutators and two armature windings.

Very often, especially on small motors, a great deal of money is spent in securing a wide variation of speed by means of field control, when this reduction in speed could be much more cheaply attained by means of a resistance in series with the armature, or a combination of both resistance and field control. This is especially true where the very slow speed is only occasionally required.

Had anyone made the statement, a few years ago, that an electric motor could be produced without any brushes on the revolving element or armature, he would have been looked upon with some suspicion, for many consider the commutator as an essential feature of a motor. To-day there are thousands of motors in use without commutator and without any current being supplied to the revolving element by means of brushes or other contacts. Such is the modern polyphase induction motor in which, as its name implies, the current is supplied to the revolving element purely by induction.

To many, an induction motor is a greater mystery than a direct current motor, and probably so on account of its simplicity of parts. Essentially it consists of one part, usually the stationary element or stator, into which the polyphase current is led, and the corresponding part, or the rotor, in which currents are induced which cause its rotation.

In the constant speed induction motor the resistance in the secondary element is made such that the drop in speed at full load is say 5 per cent. With overloads the speed drops proportionally until the maximum torque is reached and after this it drops rapidly and the torque decreases slightly also.

The greatest beauty of the polyphase induction motor is its simplicity of construction. The next advantage is the simplicity of starting. Any polyphase motor may be started by throwing into it the full potential of the circuit, such a procedure would result somewhat disastrously with most direct current motors, and would cause serious sparking with any. Throwing the full potential into the motor will result in quite a heavy starting torque, under ordinary conditions being from two to two and one-half times full load torque, which is of course greater than ordinarily required or desired. There are two methods usually employed for starting polyphase motors. Those with a fixed resistance in the secondary winding are started by applying to their terminals an electromotive force lower than normal, which is secured from two small transformers. As the motor comes up to speed the switch is thrown over, connecting the motor on the full potential for which it is designed. In motors with a variable resistance in the secondary, the full potential is thrown on the primary, but a resistance is inserted in the secondary winding, most of which is cut out as the motor comes up to speed. When running under normal conditions the performance of the two motors is practically identical.

In the same way that a direct current shunt-wound motor with constant field excitation tends to run at constant speed, so an alternating current motor also tends to run at constant speed, and as the field cannot be varied we

must vary some other element when we wish to vary the speed. The insertion of a fixed resistance in the secondary and the application of different electromotive forces will vary the speed, and the torque at the different electromotive forces will be proportional to the square of electromotive forces applied. For example, if the starting torque, that is, the torque at zero speed, be 100 pounds at 1 foot radius, with full EMF., at one-half full EMF. it will be 25 pounds.

Another method of regulation is to apply the full electromotive force, but to vary the resistance in the secondary. The motor characteristics in both cases are practically the same and are somewhat similar to those of a shunt-wound, direct current motor with resistance in series with the armature.

It has not, of course, been possible in an article of this length to indicate in more than a general way the type of motor which should be selected. In initial installations the consideration of alternating or direct current should be given careful thought. A large machine shop recently decided to install alternating motors on its tools at a considerable increase in cost over direct current motors (on account of the decreased cost of maintenance) and a large printing house put in direct current motors (because they would meet their requirements of fine speed adjustments better.)

In conclusion, the object of the writer has not been to analyze the various types of motors, but rather to make a plea for more definite information than is usually furnished to designers of electrical apparatus. To quote from Mr. Sydney F. Walker's article in the "Engineering Magazine": "An electric motor is as good-natured as most motors, but the user always suffers for over-working it, and the principal difference between it and steam or other engines in this respect is that the user generally suffers earlier with the electric motor than with others, which is, in many cases, to his ultimate advantage."

DEVELOPMENTS IN LONG-DISTANCE TRANSMISSION OF ELECTRICITY.*

The daily press tells of the successful test of street car operation in Oakland, Cal., on April 28, with electric energy generated at a point on the Yuba River, 140 miles distant. The energy is generated by water power and transmitted over a circuit composed of wires six-tenths of an inch in diameter, made of an alloy of copper and aluminum. The electrical pressure is 40,000 volts, and the loss in transmission is stated to be as low as 5 per cent.

This is by far the longest electrical transmission system for power purposes in existence, and if the loss is as small as it is stated to be it is the most promising indication of the possibilities of long-distance transmission yet furnished. Something like six years ago a test of electric transmission over a line between Frankfort and Lauffen, in Germany, a distance of 110 miles, was made for experimental purposes, but not until the test of the plant above referred to has transmission for commercial purposes over a line of such great length been a fact.

In the problem of long-distance electric transmission there are three cost factors which largely determine the economy of the scheme. These are: first, the cost of installing, oper-

*"Railway and Engineering Review."

ating and maintaining the power plant; second, the cost of transformation at the two ends of the line, including the installation and maintenance of step-up transformers at the generating end, to raise the voltage to that of economical transmission, and that of step-down transformers at the consuming end, to reduce the electrical pressure to a voltage suitable for use on commercial circuits; and third, the cost of constructing and maintaining the transmission line. Of these cost factors the first is perhaps the most uncertain. Nevertheless a careful investigation of the physical conditions to be encountered in the installation of a long-distance transmission system ought to yield estimates which closely approximate to the final cost.

In this connection it seems appropriate to remark upon some of the influences which determine the progress of electrical development, and particularly in respect to this matter of long-distance transmission. It usually occurs in the history of any science that invention and discovery precede actual development by a number of years. For instance, it was known for a number of years that machines could be constructed capable of generating energy on a large scale and at a pressure sufficient for transmission over a distance of 20 or 30 miles, within reasonable limits of cost of line construction and at a bearable loss of energy. It took time, however, to induce capital to invest in the Niagara transmission plant. The demonstration of the operation of that plant in running the street cars in Buffalo brought out no important electrical principles which had not been previously known. It did, however, give opportunity to perfect numerous minor appliances and methods of handling high-pressure electrical currents which had not been frequently afforded.

It is, of course, understood that the cost of line construction and loss of energy are reduced by increase of electrical pressure or voltage. For want of practical demonstrations on the magnitude of a commercial scale, however, there has always been some uncertainty as to the limiting voltage for which circuits could be insulated against extreme atmospheric conditions. For this reason nearly all of the high-voltage plants which have been installed up to this time have been limited to a working pressure of from 10,000 to 15,000 volts, or not greatly in excess of these figures. One exception is that in the case of the Niagara-Buffalo transmission, the voltage now being 22,000, having been recently increased from 11,000 volts, which was the original working line potential. The question of insulating for high voltage is, therefore, an important one in long distance transmission. The line pressure of the Oakland-Yuba plant is, therefore, greatly in excess of previous limits. Of course the atmospheric conditions in that part of the country are more favorable to insulation, but if no serious difficulties are encountered in working with the voltage adopted for this plant we apprehend that the pressure of high-voltage plants constructed in the future will be generally increased.

The progress of these advancements in electrical transmission thus depends more largely upon the question of enlisting capital in the construction of such systems than upon new inventions. Mechanical and electrical engineers are readily able to design machinery and to calculate the results to be obtained from the transmission of electricity at a certain

voltage over a line of calculated section, but the necessary initiative in all such advanced work is some assurance that an installation of the kind will effect some economy in cost of power. As industrial conditions are continually enforcing new economies capital is encouraged to take hold of untried schemes of plausible character, and it is this boldness of capitalists to invest in these schemes which shares the rewards with inventive genius.

LONDON NOTES.

(From our London Correspondent.)

Institution of Electrical Engineers.

On May 2d a paper was read by Mr. Frank Holden on "A Watt-Hour Meter." Mr. C. G. Lamb and Mr. Miles Walker followed with a description of an instrument for measuring the permeability of iron and steel. It has been designed to meet the demand for a simple, cheap and reliable piece of apparatus for the particular purpose. The authors tried to construct an instrument which would be extremely simple to use, and whose calibration should be dependent on such principles as should render it incapable of alteration with time and with somewhat careless usage. The principle adopted was that of balancing the reluctance of an air-gap against that of the specimen under test by means of altering the length of the air-gap. Since the reluctance of such an air-gap of given dimensions is invariable, the accuracy of an instrument based on this principle depends only on the accuracy with which the dimensions of the air-gap can be measured, and the delicacy with which the point of balance can be ascertained. The authors described the instrument used to fulfill these conditions. The manner of carrying out the calibration of the instrument was described.

100 vs. 200-volt Supply.

The Board of Trade has just issued its decision in regard to the power of electricity supply authorities to change over consumers' supply from low to high voltage, which it will be remembered formed the subject of a public inquiry in London. The new regulations are so worded as to indicate that companies are not to be handicapped by a few objecting consumers. It is further decided that if such consumers refuse their consent to change being made in the pressure, the companies may appeal to the Board of Trade who will overrule the objections if it thinks the circumstances warrant that course. The board may, if it so choose, relegate the matter to an arbitrator for settlement.

Montreal Men for Paris.

When Mr. Duncan McDonald late superintendent of the Montreal Electric Street Railway Company, was appointed manager of a tramway company in Paris, France, some months ago, he engaged several conductors and motormen from the Montreal street cars. He then received a great many applications from Montreal street railway men, but as it was impossible to accept them all he promised to endeavor to find work after a time for some of the rejected ones, and recently he engaged engineers Pare and Griffin of Montreal who will be inspectors for the Parisian company.

NATIONAL ELECTRIC LIGHT ASSOCIATION CONVENTION.

Secretary Porter says that all arrangements have been completed for holding the Twenty-fourth Convention of the National Electric Light Association at Niagara Falls on May 21, 22 and 23. The headquarters of the Association will be at the International Hotel.

Mr. C. O. Baker, Jr., Master of Transportation, has sent us the following: "It was stated in transportation notice sent out last week that extra cars would be attached to 8:30 A. M. train of the New York Central & Hudson River Railroad on Sunday and Monday. This is an error, as the 8:30 A. M. train does not run on Sunday, neither will extra cars be attached to this train on Monday (Empire State Express), but necessary extra cars will be attached to all other trains."

The following is the official programme of the Convention:

TUESDAY, MAY 21.

Meeting of the Executive Committee at 9 A. M. at the Secretary's office, International Hotel.

Morning Session, 10 o'clock.

At Convention Hall, International Hotel.

Address by President Cahoon.

Paper by C. R. Van Trump, Wilmington, Del., "A Station Load Diagram."

Afternoon Session, 2 o'clock.

Paper by Francis W. Willcox, Harrison, N. J., "The Practical Side of the Incandescent Lamp."

Report of Committee on Standard Candle-Power of Incandescent Lamps, Dr. Louis Bell, chairman.

Report of Committee on Amendments to Freight Classification of Electrical Apparatus, James I. Ayer, chairman.

WEDNESDAY, MAY 22.

Morning Session, 10 o'clock.

Paper by H. W. Hillman, Schenectady, N. Y., "Arc Lighting at the Beginning of the Twentieth Century."

Report of Committee on Photometric Value of Arc Lamps, Henry L. Doherty, chairman.

Afternoon Session, 2:30 o'clock.

Paper by Louis R. Wallis, Woburn, Mass., "The Foresee (4-C) System of Charging."

Report of Committee on Uniform Accounting, G. E. Tripp, chairman.

Report of Committee on Analysis of Flue Gases, Henry L. Doherty, chairman.

Executive session.

Report of Committee on Legislative Policy, Samuel Insull, chairman.

THURSDAY, MAY 23.

Morning Session, 10 o'clock.

Paper by Augustus Treadwell, Jr., New York City, "Storage Batteries in Central Station Work."

Report of Committee on Rules for Electrical Construction and Operation, Capt. William Brophy, chairman.

Topic: "Steam Heating from Central Stations."

Afternoon Session, 2:30 o'clock.

Paper by Calvin W. Rice, New York City, "Distribution of Current at High Potential in New York City."

Report of Committee on Amendments to By-Laws, Samuel Insull, chairman.

Executive session.

Reports of Secretary and Treasurer and Executive Committee.

Election of officers.

INSIGNIA.

Officers, red bow.

Executive Committee, blue bow.

Active Members, brown ribbon.

Associate Members, turquoise blue ribbon.

Reception, yellow ribbon.

Guests, rose ribbon.

Honorary members, white ribbon.

Press, olive green ribbon.

New York Electrical Society.

The 215th meeting of the Society will be held at the College of the City of New York, Lexington avenue and 23d street, Thursday, May 16, at 8 p.m. Dr. W. E. Geyer, of Stevens Institute of Technology, Hoboken, will lecture on "Inductance." This interesting lecture will be entirely non-mathematical. The nature of inductance will be explained by many striking experiments, the desired effects being made apparent to the eye by using incandescent lamps as ammeters and voltmeters. The following are some of the points that will be illustrated: Gradual rise and fall of current—Choking effect—Lag—Inductance affected by form of circuit—Circuit changing its form to make the inductance a maximum—Energy stored in circuit—Inductance balanced by capacity in series and in parallel.

Moved into More Commodious Quarters.

The Shelby Electric Company has moved its New York office from 141 Broadway to larger and more elaborate offices in the Parker Building, 4th avenue and 19th street. Mr. James C. Wormley, Eastern manager of the company, reports a very large business for the past year. He says the company is having a lamp testing laboratory for any make of lamp put in at a great deal of expense and which will be open to all visitors. The Shelby Company also proposes carrying a complete stock of 50,000 lamps.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended May 8:

Antwerp, 20 packages, \$399; Argentine Republic, 18 packages, \$309; Australia, 51 packages, \$6,534; Berlin, 60 cases, \$3,654; Brazil, 2 packages, \$26; Bremen, 7 cases, \$324; British Guiana, 12 packages, \$316; British West Indies, 40 packages, \$877; 4 cases, \$375; British Possessions in Africa, 151 packages, \$12,667; British East Indies, 12 packages, \$1,105; Central America, 77 packages, \$1,271; China, 6 packages, \$270; Cuba, 170 cases, \$2,787; Genoa, 1 case, \$10; 8 packages, \$185; Glasgow, 123 packages, \$6,928; Hamburg, 71 packages, \$3,158; Havre 67 packages, \$4,639; Japan, 116 cases, \$29,486; Leicester, 2 packages, \$50; Lisbon, 11 packages, \$208; Liverpool, 164 packages, \$6,183; London, 31 packages, \$7,783; 16 cases, \$914; Marseilles, 75 cases, \$800; Mexico, 404 cases, \$10,108; Milan, 3 cases, \$100; Naples, 10 packages, \$65; Peru, 2,300 packages, \$17,715; Preston, 2 cases, \$40; Philippines, 117 packages, \$6,780; 1 case, \$30; Santander, 5 cases, \$151; Santo Domingo, 4 cases, \$35; Southampton, 64 cases, \$6,944; Sucz, 1 coil cable, \$834; St. Petersburg, 6 packages, \$326; U. S. Colombia, 11 packages, \$45; Venezuela, 26 packages, \$405.

PERSONAL MENTION.

Mr. Andrew Hickenloper was recently elected president of the Cincinnati Gas & Electric Company.

Mr. William A. Marshall has accepted the position of secretary and manager of the Orange County Telephone Company in Middletown, N. Y.

INCORPORATIONS.

The Electric Motor & Generator Ventilating Company Wilmington, Del. Capital stock, \$100,000.

The Compton Land, Water & Electric Company, Los Angeles, Cal. Capital stock, \$500,000. Incorporators: J. R. Compton, G. W. Cox and G. D. Sanford.

The Electric & Steam Railway Supply Company, Lafayette, Ind. Capital stock, \$5,000. Directors: Francis W. Powers, Martin L. Snyder, William W. Hoffman and Scott Shobe.

The Royal Electric Light Company, Royal Center, Ind. Capital stock, \$10,000. Directors: Ernest B. Thomas, John J. Schmidt, Waterman G. Sweet, William H. Bingaman and James L. Thomas.

The Robinson Water, Light & Heat Company, Robinson, Ill.—to operate electric light, heat and power plants. Capital stock, \$70,000. Incorporators: C. S. Jones, F. Bartmes and A. H. Bayston.

The Rome Gas, Electric Light & Power Company, Rome, N. Y. Capital stock, \$400,000. Directors: James T. Lynn of Detroit, Martin B. Daly of Toledo, O., and John D. McMahon and others of Rome.

The Pan-American Motor Company, Trenton, N. J. Capital stock, \$100,000. Incorporators: A. T. Thompson, J. F. Fox and H. G. Derby of New York, H. W. Whipple and W. M. Power, both of New Jersey.

The North Coast Electric Company, Everett, Wash.—to conduct a general electric construction business and to string wires for the purpose of conducting a messenger service such as is used in all large cities.

The Paris Transit, Light & Power Company, Paris, Tex. to operate a street railway and to supply gas and electricity. Capital stock, \$250,000. Incorporators: W. F. Little, R. H. Correll of St. Louis, W. F. Dulaney, R. W. Wortbam and S. M. B. Long, all of Paris.

The Akouphone Company, New York City to manufacture instruments to enable the deaf to hear and the dumb to speak. Capital stock, \$700,000. Directors: Benjamin H. Adams, Herbert W. Grindal, Henry D. McGowan, Charles W. King and David U. Jennings, New York City.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED MAY 7, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

673,441. Trolley-Base. Frank A. Merrick and Frank W. Garrett, Johnstown, Pa., assignors to the Lorain Steel Company of Pennsylvania. Filed Aug. 16, 1900.

673,531. Electric-Railway Controller. Edward M. Bentley, Lawrence, N. Y., assignor to the General Electric Company, Schenectady, N. Y. Filed June 17, 1899.

673,538. Electric-Railway Conduit. Frank Hewer, Chiswick, Eng. Filed June 12, 1900.

673,660. Rail-Bond. William T. Pringle, Lansdowne, Pa. Filed Jan. 15, 1901.

673,735. Street Car Fender. Arthur L. Siegel and James St. J. Lambe, St. Louis, Mo., assignors of one-third to Frank Gaennle, same place. Filed Feb. 2, 1901.

673,765. Telltale for Rail-Bonds. James A. Emery, Atlanta, Ga. Filed Oct. 4, 1900.

673,766. Overhead Trolley. Henry C. Eno, Pittsfield, Mass., assignor of one-fourth to George H. Russell, same place. Filed July 7, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

673,394. Incandescent-Mantle Support. Max Herskovitz and Abraham L. Herskovitz, Chicago, Ill. Filed July 23, 1900.

673,563. Safety-Catch for Incandescent Electric Lamps. George B. Millen, San Francisco, Cal. Filed July 14, 1900.

673,713. Spark-Discharging Device for Electric Lighting for Gas-Burners. Paul Hoffmann, Charlottenburg, Germany. Filed March 24, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

673,405. Machine for Cutting Fabrics. Henry A. Meyer, Cincinnati, O., assignor to the Wolf Electrical Promoting Company, same place. Filed Sept. 22, 1900.

673,565. Electric Controller. William Morrison, Chicago, Ill., assignor to the Helios-Upton Company, same place. Filed June 18, 1900.

673,567. Electric Transformer. Louis M. Pignolet, Orange, N. J. Filed Sept. 10, 1898.

673,624. Electromagnet and Annunciator. Charles E. Scribner, Chicago, and Frank R. McBerty, Downer's Grove, Ill., assignors to the Western Electric Company Chicago, Ill. Filed April 6, 1893.

673,694. Machinery for Covering Electrical or other Wires for Insulating Purposes. Walter W. Colley, London, Eng. Filed June 4, 1900.

673,709. Lathe. Frederick B. Duncan, Madison, Wis., assignor to the Northern Electrical Manufacturing Company, same place. Filed Aug. 10, 1900.

673,731. Electric-Motor Controller. Oscar F. Shepard, Jr., Madeira, O., assignor to the Warner Elevator Manufacturing Company, Cincinnati, O. Filed Oct. 3, 1900.

673,807. Controller for Rotary Transformers. Thomas S. Watson, Milwaukee, Wis. Filed June 4, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

673,376. Electrical Signaling System. Harry R. Bennett, San Francisco, Cal. Filed Aug. 9, 1900.

673,504. Telephone-Switchboard. Isidor J. Kusel, Chicago, Ill., assignor to the Eureka Electric Company, same place. Filed Sept. 27, 1900.

673,512. Microtelephonic Apparatus. Jacob Berliner, Hanover, Germany. Filed Dec. 4, 1900.

673,794. Electric Signal and Telephone System. Charles L. Fortier, Milwaukee, Wis., assignor of one half to Alfred Weller, same place. Filed June 12, 1899.

673,795. Telephone-Service Apparatus. Uriah S. Jackson, Ossipee, N. H. Filed Nov. 22, 1900.

MISCELLANEOUS.

673,381. Printing-Telegraph Instrument. Louis M. Casella, London, Eng. Filed Aug. 10, 1900.

673,391. Current-Regulator. James P. Erie, New York City, assignor to the Erie Exploration Company, same place and Dover, Del. Filed Jan. 4, 1901.

673,392. Rheostatic Support. James P. Erie, New York City, assignor to the Erie Exploration Company, same place and Dover, Del. Filed Sept. 13, 1900.

673,396. Horn or Trumpet for Phonographs. George L. Hogan, New York City. Filed May 28, 1900.

673,413. Multiple Phonogram or Record Holder. William T. Baker and Benjamin F. Clayton, Louisville, Ky. Filed June 21, 1900.

673,418 673,553. Apparatus for Use in Wireless Telegraphy. John Barry, Fort Lee, N. J. Filed Sept. 2-9, 1899.

673,428. Current-Regulator. James P. Erie, New York City, assignor to the Erie Exploration Company, same place and Dover, Del. Filed Sept. 17, 1900.

673,449. Telegraph-Key. Frank J. Raab, Toledo, O. Filed June 14, 1900.

673,452. Electrolytic Apparatus. Isaiah L. Roberts, Brooklyn, N. Y., assignor to the Roberts Chemical Company of New Jersey. Filed Jan. 21, 1899.

673,453. Connector for Electrodes. Isaiah L. Roberts, Brooklyn, N. Y., assignor to the Roberts Chemical Company of New Jersey. Filed June 25, 1895.

673,476. Device Employing Electric Resistance. Conway Robinson, Elwood, Ind. Filed March 15, 1900.

673,519. Multiple Telegraph. Samuel T. Foster, Jr., Laredo, Tex. Filed March 14, 1899.

673,521. Manufacture of Solenoid or other Electric Coils. John A. Heany, Philadelphia, Pa., assignor to the Teter Heany Developing Company, same place and Charleston, W. Va. Filed Feb. 18, 1901.

673,619. Motor Vehicle. Elwood Haynes and Elmer Apperson, Kokomo, Ind. Filed July 13, 1900.

673,643. Power-Transmission Device. Harry A. Knox, Springfield, Mass. Filed Oct. 5, 1900.

673,652. Storage Battery Cell. Jacob C. Chamberlain, New York, and Henry R. Sutphen, Hightbridge, N. Y. Original application filed Sept. 11, 1899. Divided and this application filed Nov. 9, 1900.

673,656. Bushing for Electrical Outlet-Boxes. Hubert Krantz, Brooklyn, N. Y. Filed Feb. 9, 1901.

673,678. Storage Battery. Jacob C. Chamberlain, New York, and Henry R. Sutphen, Hightbridge, N. Y. Filed Sept. 11, 1899.

673,710. Terminal and Binding-Screw for Electric Batteries and Connections. William R. Edwards, Weybridge, Eng. Filed Nov. 2, 1900.

673,734. Process of Electrolytic Decomposition. George Bell and George W. Bell, Liverpool, Eng. Filed June 7, 1898.

673,761. Process of Reducing Sodium Compounds. Alfred H. Cowles, Cleveland, O., assignor to the Electric Smelting & Aluminum Company of Illinois. Filed July 20, 1895.

673,792. Storage Battery. David W. Beebout, Pittsburg, Pa. Filed Feb. 19, 1900.

DESIGN.

442. Telephone-Supporting Bracket. Ray V. Griggs, Chicago, Ill. Filed March 25, 1901. Term of patent years.

THE TELEPHONE WORLD.

New York's Increase in Telephones.

New York has become by far the greatest telephone city in the world, Berlin being second and London third. The rapid increase in the use of the telephone in this city has been due to the extraordinary activity both in commercial and financial circles, especially in the Wall Street district.

In the last three years the increase in the number of stations in this city has been 30,000, the gain for each year large, exceeding that of the previous year. In 1898-1899 the gain was more than 8,000 stations; in 1899-1900, more than 12,000 stations and in the twelve months ending April 30 the gain has been more than 15,000 stations.

Worcester, Mass., is to be made a link in a wireless telephone and telegraph system extending from Boston to New York and already men have been in that city looking over the ground. The line is to be built by the New England Wireless Telegraph & Telephone Company with headquarters in Boston. The instruments for the establishment of the line are now being made in Boston and the books of the company have been opened for subscriptions. The company is a licensee of the American Wireless Telegraph & Telephone Company and \$1,250,000 of the stock of the New England Company is to be placed in the treasury of the parent company. The president of the New England Company is J. H. Huston, and the office of the company has been established in the Boylston Building, Boston.

The Pennsylvania Telephone Company is making a number of important improvements to its line in Steelton. At many points new poles are being planted and on some of the streets the line is being extended. The new poles erected are very heavy, and much higher than the old ones. During the past month nearly thirty new 'phones have been placed in Steelton business houses and private residences.

A local telephone exchange in connection with the long-distance system of the Central New York Telephone & Telegraph Company has been installed in Morrisville in this State. The number of subscribers is limited, but it is expected that there will be more as soon as the service is in good working order and its convenience is appreciated.

The directors of the Iron Range & Electric Telephone Company, capitalized at \$50,000, with headquarters at Wadena, Minn., have filed articles of incorporation with the Secretary of State. The officers are: A. B. Kerlin of Park Rapids, president; W. R. Baumbach of Park Rapids, vice-president and treasurer; C. W. Baumbach secretary.

The telephone line from Rosenberg to Damon's Mound, Tex., is now an assured fact. It is proposed for this line to extend to Damon on the south and Richmond on the east, and with the improvement that is now going on at Damon it will fill a much needed want.

The annual report of the New England Telephone & Telegraph Company for the year ended December 31, 1900, compares as follows: 1900—Gross earnings, \$4,518,396, increase over 1899, \$572,042; operating expenses, \$3,621,644; increase, \$138,842. Net earnings, \$896,752; increase, \$113,200.

The Independent Telephone Company, which was organized in Liberty, Neb., some time ago, has proven a success. Seventy-five shares have been sold, and forty miles of line are under construction. Over one-half of the shares have been sold to farmers.

The Weston, O., Mutual Telephone Company has been formed with the following officers: President, I. B. Ballmer, secretary, G. W. Smith; treasurer, Ed. Guyer; directors: J. E. Clark, Milton Brundage and L. H. Sheley.

The Citizens' Telephone Company of St. Johnsbury, Vt., has begun the work of continuing its lines towards Wells River. The construction of a line to the eastern towns will be commenced at an early date.

The plant of the Standard Telephone Company in Madison, Wis., was practically destroyed by fire a short time ago. Loss on stock amounts to \$10,000; on building, \$1,000; fully insured.

An independent company will put in a telephone exchange at Hutchinson, Kan., this summer. A franchise has been granted to Messrs. Bellamy and Burns.

The Union Telephone Company at Alma, Mich., has added 50 new 'phones to its exchange. It is also enlarging its plant by putting in new switchboards and higher poles.

Extending and Improving Its System.

The Citizens' Telephone Company of Grand Rapids, Mich., is planning large extensions to its local service this summer, and also for many new State lines. The city improvements will consist chiefly in placing several hundred more copper wire long distance conduits. Before June 1, 400 more will be placed there and several others will follow before snow flies again, in addition to extending the local service by means of poles into portions of the city never before reached by telephone.

In the State one of the most important lines to be built is from Hastings to Lowell, by way of Clarksville, Freeport, Elmdale and Alto. This is already under way. A line of 40 or 50 new farm telephones has been added to the Vermontville exchange.

A copper wire circuit will be completed as far north as Manton before August 1. It is now completed as far as Big Rapids. An exchange at Luther has just been installed and a line is being built from Hersey to Everett. In operating these lines, the company co-operates on the most intimate terms with the Union Telephone Company, an independent concern owning lines throughout the central part of the State and running as far east as Saginaw. It is capitalized at \$150,000, and has its headquarters at St. Johns.

Another copper wire circuit is being built to Muskegon via Grand Haven. Connections with Detroit by way of the long-distance lines of the Everett-Moore syndicate, which is building the new exchange there, will be established some time during the summer.

The Southern Bell Telephone & Telegraph Company is making extensive improvements in its long distance service. Two additional copper circuits are being constructed between Macon and Atlanta, Ga., and when completed the total number of copper circuits between these cities will be four, and another circuit is being placed between Macon, Albany, Americus and Thomasville. Another circuit is being erected between Atlanta and Chattanooga, and when this is completed a through line will be open to New York by the way of Charlotte, Richmond and Washington. The building of this line will give more direct service between these cities.

A meeting of the stockholders of the Automatic Telephone Company of Waterbury, Conn., has been called for the purpose of winding up its affairs. The company, which held valuable concessions from the city but has never built a plant, has decided to give up its organization on account of the refusal of the State Legislature to repeal the clause of the general telephone law which compels new companies to receive the sanction of the courts on the ground of public necessity and convenience. On the same ground a number of other independent telephone companies in Connecticut will dissolve.

A telephone line is being constructed between Moulton and Hillsboro, Ala. Moulton is 14 miles off the railroad and this telephone line will be of inestimable value to those living in the lower valley. It is stated upon good authority that the gap in the long distance telephone line between Leighton on the west and Hillsboro on the east, a distance of 20 miles, will be filled in very soon.

The Michigan Telephone Company of Detroit reports a net gain of 599 subscribers in April, making a total number of 47,202 subscribers on April 30. The Erie Telephone system, of which this company is a part, reports a net gain of 1,961 subscribers in April, and a gain of 4,981 since January 1, making a total number of 146,580 subscribers on April 30.

The Troy, N. Y., Telephone & Telegraph Company will soon have a new home. The old building will be abandoned, and the new building will be converted into a modern exchange. Among the many improvements to be made will be the insertion of a new switchboard.

The Twin City Telephone Company is receiving bids for the erection of its new West Minneapolis, Minn., exchange building, which is to cost something over \$7,000, and will be completed within sixty days of the letting of the contract.

Edward DeLong has received the contract for 900 poles from the Schuylkill Telephone & Telegraph Company. They will be used on the new line between Reading and Allentown, Pa., and must be delivered by July 1.

The La Crosse, Wis., Telephone Company is building a large addition to its establishment to be used as a mechanical shop. Many improvements are also being made in the old part.

Nelson, Neb., is making an effort to secure telephone connection with the outside world.

Telephoning in Germany.

United States Consul Brainard H. Warner, Jr., stationed at Leipzig, Germany, has informed the State Department that the long-distance telephone line connecting the cities of central Germany with Frankfurt, Kalk, Muhlheim, Cassel and Wiesbaden, in the western part of the empire, has been opened to the use of the general public. The charge for using this line is 1 mark, or nearly 24 cents, for every three minutes of conversation to any one of the above mentioned places.

D. McReynolds, district superintendent of the construction department of the Southwestern Telegraph & Telephone Company, has lately been in Galveston, Tex., looking after the work of putting in the underground system there that is now in progress. He says that the work has proceeded satisfactorily so far. Mr. McReynolds estimates the cost of putting in the underground system together with that of the drainage system necessary to maintain it at \$95,000.

Wireless telephone messages were recently sent across the Mississippi, a distance of 1,000 feet. The apparatus consisted of 150 feet of copper wire on each bank, strung parallel to the river, and connected to transmitters, receivers and batteries. The first experiment was made with an electric current of five volts, and while the messages could be heard the words could not be made out. Other batteries were then attached, and with twenty volts at the sending end of the line and five at the receiving end the words could be heard as well as if sent by an ordinary telephone.

The Northwestern Telephone Exchange of St. Paul, Minn., reports a net gain of \$33 subscribers in April, making a total number of 22,512 subscribers on April 30. The Erie Telephone system, of which this company is a part, reports a net gain of 1,961 subscribers in April, and a gain of 4,981 since January 1, making a total number of 146,580 subscribers on April 30.

The Rural Telephone Company of Humboldt, Neb., and Spieser townships, has completed organization and sold the bulk of the shares. Construction work has begun and before many weeks connection will be made with the local city exchange and toll lines. The Rural system covers quite an area and will no doubt be a great advantage to the farmers.

The People's Telephone Company of Superior, Wis., has received a carload of new cables for use in the extension of the lines of the company in different parts of that city. A large number of new telephones have been put in by the company of late and especially since the railroads were all connected with the new company 'phones.

The license board of Bangor, Me., held its annual meeting, and the petition of the New England Telegraph & Telephone Company for the right to place its wires underground was presented. After considering the request very carefully the board decided that it would not be advantageous to the city to grant the company the desired permission.

The Perkiomen Telephone Company will shortly erect poles and string wires. The line will be extended to Hillegas and Red Hill, Pa.

A rural telephone line is being built from Atchison to Doniphan, Kan., a distance of about seven miles.

TELEPHONE INCORPORATIONS.

The Citizens' Telephone Company, Toronto, O. Capital stock, \$10,000.

The Adair Telephone Company, Adair, Ia. Capital stock, \$10,000. Incorporators: L. H. Paine and others.

The Batavia Home Telephone Company, Batavia, N. Y. Capital stock, \$160,000. Directors: S. B. Rawson, J. H. Griswold and A. E. Lord, Elyria, O.

The Richardson Telephone Company, Richardson, Tex. Capital stock, \$750. Incorporators: C. H. Blewett, W. N. Stults, C. C. Huffines and others.

The Union Telephone Company, Cedar, Ia. Capital stock, \$10,000. Incorporators: C. Bradley, William Abegg, R. E. Holloway, J. V. Garvin, James L. Moore, A. J. Fairchilds, Moses Picken, R. J. Woody and C. A. Moore.

The Saratoga Telephone & Telegraph Company, Saratoga Springs, N. Y.—to operate in Saratoga Springs, Ballston Spa, Mechanicsville, Stillwater, Waterford, Troy, Schuylerville, Glens Falls, Schenectady and in the various cities, towns and villages of Saratoga, Fulton, Warren and Schenectady Counties. Capital stock, \$125,000. Directors: F. K. H. Beach, Stephen C. Medbery, I. W. Wiswall and Herbert C. Westcott, of Ballston Spa, and Charles W. Coal, W. L. Burke and William P. Burtley of Glens Falls.

GENERAL ELECTRICAL NEWS.

Lighting.

Baker City, Ore.—This city has voted to bond itself for the purpose of erecting a municipal electric light plant.

Bristol, Tenn.—A. S. McNeil and J. F. Hicks will organize a company to build an electric light plant.

Brownsville, Ore.—W. C. Peterson is figuring on putting in an electric light system here.

Charlotte, N. C.—F. F. Van Deventer and associates of Knoxville, Tenn., have applied for a franchise to construct a water power electrical plant.

Chillicothe, Mo.—Chillicothe has voted to issue \$25,000 in bonds to build a municipal electric light plant.

Clarksville, Ia.—The question of erecting an electric light plant is being agitated here.

Columbus, Miss.—The Columbus Light & Power Company will remodel its two plants this summer, installing a new and larger electric equipment.

Columbus, O.—The Cincinnati Gas Light & Coke Company has increased its capital stock from \$9,280,000 to \$28,280,000, in accordance with a consolidation effected recently at Cincinnati, and then changed the name to the Cincinnati Gas & Electric Company.

Covington, Ga.—At an election held recently Covington voted for bonds for the purpose of establishing electric lights.

Dunlap, Ia.—The question of erecting an electric light plant here is being agitated by the people.

Ellsworth, Wis.—The village board has leased a space on the village lot to Willy & Buck of Elroy, Wis., for a term of 99 years to be used only for a city electric light plant.

Greenville, N. C.—This city has appointed J. L. Ludlow of Winston as engineer to prepare plans for the electric light plant, etc.

Havre, Mont.—The citizens have voted to issue bonds to build an electric light plant.

Independence, Kan.—The Independence Electric Street Railway Company has made application to the city council for a franchise for an electric light plant for this city.

Kissimmee, Fla.—This city will soon erect an electric light plant.

La Claire, Ia.—Steps are being taken here to establish an electric light plant. Capt. Orin Smith and H. A. Horton are said to be pushing the scheme and much encouragement is being given.

Lincoln, Ill.—A Chicago light company has made an offer to the city council to construct a municipal electric light plant to cost about \$30,000. The proposition is now under consideration.

Lowell, Mass.—The city council is considering the question of erecting a municipal electric lighting plant.

Mayfield, Ky.—The Graves County Water & Light Company of this place has decided to erect a new electric light plant.

Montreal, Can.—Bids will be received until June 15 at the office of L. O. David, city clerk, for installing and maintaining electric arc and other electric lamps for lighting the streets, highways, etc., in this city.

Oakdale, N. Y.—W. K. Aston's property at this place was lately sold to Mr. Plympton, who proposes to make many improvements, including an electric plant, new inland waterways, floating gardens, a boulevard on the shorefront and artistic bridges.

Oakland, Cal.—The citizens are agitating the question of erecting a municipal electric lighting plant.

Orlando, Fla.—This city will grant a franchise for an electric light plant. Bids are solicited. Address J. Duke, city clerk.

Ottawa, Baach, Mich.—A new electric light plant will be built here this summer to take the place of the present equipment and will be built on the shore of Black Lake near the old plant.

Park River, N. D.—This city is figuring on putting in a modern electric light system.

Parsons, W. Va.—H. K. Grib has asked for a franchise to erect an electric light plant here.

Richfield, Utah.—The question of erecting an electric light plant in Richfield is being agitated.

Richmond, Ky.—The Richmond Water & Light Company, which has a \$10,000 water and gas plant here, will shortly begin the erection of an electric light plant costing \$16,000.

Salt Lake City, Utah.—E. W. Hammer, of the Utah Home Telephone Company, will ask this city to grant his company an electric light franchise.

Silver Creek, N. Y.—This place is to have an up-to-date electric light plant.

Toluca, Ill.—The Toluca Electric Light & Gas Company was incorporated for \$15,000 by C. H. Devlin, H. Duggan and D. M. Wood.

Warrenton, Va.—G. B. Stone and F. D. Gaskins of this place have been inspecting the electric and ice plants in Lynchburg, with a view to establishing similar plants here.

Woodland, Cal.—J. Martin, the San Francisco capitalist, has purchased the Woodland electric and gas plants and will make extensive extensions and improvements amounting to \$20,000.

Woodstock, Va.—The town council has granted a franchise to the Woodstock Electric Light Company, and electric lights are assured.

Street Railways.

Albany, N. Y.—The Westchester Electric Railroad Company has filed with the Secretary of State a certificate of extension of its route in New Rochelle.

Baltimore, Md.—The Baltimore & Washington Electric Railway Company, with a capital of \$1,500,000, was organized here last week to build a trolley road between this city and the national capital with a branch to Annapolis.

Charleston, Ill.—The electric street railway between this city and Mattoon will soon be built. The directors have decided to increase the capital stock from \$125,000 to \$200,000. The Charleston-Mattoon line will be 12 miles long. F. Bolton of Huntington, Va., is president of the company. C. Fairbanks of Terre Haute, and M. R. Williams of Indianapolis are also interested.

Kenosha, Wis.—P. J. Haynes and G. L. Claussen of Chicago have secured a right of way for the building of an electric railway from this city to the junction of the Chicago, Milwaukee & St. Paul Railway at Truesdell.

Las Vegas, N. M.—The Las Vegas & Hot Springs Electric Railway Light & Power Company has been incorporated for \$200,000 by J. E. Merryman, V. O. Saunders and G. W. Baumhoff. The purpose of the company is the construction of a street railway and electric light plant at this place and neighboring towns.

Romeo, Mich.—The council has granted a franchise to the Detroit, Utica & Romeo Electric Railway Company. The road will be 8 miles long.

Schenectady, N. Y.—The Schenectady Street Railway Company contemplates the building of a trolley line from this city to Troy going by way of the Troy turnpike.

San Francisco, Cal.—It is reported here that Capt. Delamar, the owner of the Bully Hill copper mines, in Shasta County, has offered to buy the famous Balaklava copper property, near his present holdings. If the deal goes through the captain contemplates the construction of an electric railway between the properties connecting with a point near the junction of Sacramento and Pitt Rivers.

Toledo, O.—The Toledo-Bryan Air Line Company of this city was lately incorporated with \$1,250,000 by J. L. Yost, F. V. H. Collins, W. C. Brewer and M. Taylor. The company will construct an electric railway from Bryan through Williams, Fulton and Lucas counties to this city.

Tomahawk, Wis.—The Wisconsin River Electric Railway Company has been incorporated to build an electric line from here to Stevens Point and Grand Rapids.

Warren, O.—Manager A. A. Anderson of the Trumbull Electric Railway will ask a 50-year franchise for a single track line between this city and Leavittsburg.

Manufacturing.

Boston, Mass.—The Electric Manufacturing Company has been incorporated under the laws of this State, with a capital of \$650,000, to manufacture and sell electricity for mechanical power in this city, and to manufacture storage batteries. John A. Haskell, G. H. Butters, Wallace B. Donham, James Dean and Frederick Carls are the shareholders.

Chicago.—Homer H. Peters, Henry A. Thexton and Joseph L. Harrington are interested in a \$2,000 concern known as the Thexton Electric Envelope Sealer Company, which will manufacture novelties.

Hartford, Conn.—It is rumored that the Perkins Electric Switch Manufacturing Company of this city is to move its works to Bridgeport, with the Bryant Electric Company of that city, with which it is closely associated.

Middletown, Conn.—It is reported here that R. M. Keating has purchased the factory formerly occupied by the Mills Bell Company. It is said that Mr. Keating will manufacture electric machinery for purposes where a small power is desired.

Trenton, N. J.—The Wheeler Electric & Manufacturing Company, capitalized at \$100,000, has been formed by Wm. M. Pawley of New Jersey and Daniels & Co. of New York. The Delaval Steam Turbine Company, with a capital of \$1,000,000, was incorporated here last week to manufacture steam turbines, dynamos and other electrical apparatus.

West Chester, Pa.—Philadelphia is soon to lose the Sun Electric Appliance Manufacturing Company, which is to be located here.

Company Matters.

Gilsum, N. H.—The directors of the Keene, Marlow & Newport Electric Railway Company held an adjourned meeting here a short time ago at which by-laws were adopted and officers were elected as follows: President, Elgin A. Jones, of Marlow; vice-president, Frank E. Nesmith, of Surry; clerk, John A. Smith, and treasurer, Israel A. Loveland of this place.

Power and Transmission.

Cumberland, Md.—The Great Falls Water Company has offered the trustees now operating the Chesapeake & Ohio Canal \$75,000 for the use of certain water rights along the Great Falls. The State board of public works asked that the right be held off, as an opposing company would give \$100,000 for it. It is the plan of the latter company to erect a steel dam across these waters for the purpose of generating electricity. This is to be carried to Washington and other points. The plan is to generate at least 10,000 horse power, and the works will cost from \$1,500,000 to \$2,000,000. The syndicate is headed by James F. McLaughlin, of Toronto, Can.

Mines.

Redding, Cal.—The smelting plant of the Mountain Copper Company at Keswick is to be operated wholly in the near future with electrical power. It is hoped to supply not only the other big mines of the county with electrical power and light, but the cities of Redding, Red Bluff, Cottonwood and Anderson as well.

Automobiles.

Ashland, O.—H. K. Clover and E. O. Flanders, who operated the automobile works at Anderson, Ind., are interested in a similar project here.

Niles, O.—A recent report claims that this city wants to secure the plant of the Akron Motor Carriage Company. W. A. Fritchard, L. Holloway, Wade A. Taylor, I. Baldwin and F. B. Harris, members of the Niles board of trade, have been conferring with the officials of the Akron Motor Carriage Company.

Utica, N. Y.—It is stated that the Remington Automobile Company has begun the removal of the machinery from Ilion to this city. The launch department of the business promises to be an important branch.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Authoriz'd	Issued.					Authoriz'd	Issued.				
Albany, N. Y. —May 13						Hartford Conn. —May 13					
United Traction.....	100	\$5,000,000	\$5,000,000	1% Q.	105 106	Hartford Street Ry. Co.....	100	\$4,000,000	\$200,000	1% S. Oct.,	150
(Consolidation of the Albany and Troy City Railway.)						Hartford & West Hartford RR.....	100	1,000,000	247,000		
Allentown Pa. —May 13						Holyoke Mass. —May 13					
Allentown & Lehigh Val. Trac Co.....	100	4,000,000	1,500,000		15	Holyoke Street Ry. Co.....	100	400,000	400,000	1% A. June,	207 1/2 212
Bridgeport, Conn. —May 13:						Hoboken N. J. —May 13					
Bridgeport Traction Co.....	100	2,000,000	2,000,000	1% Aug.,	100	North Hudson Co. (N. J.) Ry. Co....	25	1,250,000	1,000,000	5%	180
Baltimore Md. —May 13						Indianapolis, Ind. —May 13					
a United Rail ways & Elec. Co.....com.	50	24,000,000	13,000,000		17 1/2 17 3/4	**Indianapolis Street Ry.....	100	5,000,000	5,000,000		25 25 1/2
Boston, Mass. —May 13						Lancaster, Pa. —May 13					
New England Street Ry.....	25	5,000,000	1,081,925	1% Q., Jan. 15,	15 16	Pennsylvania Traction Co.....	100	10,000,000	9,900,000		
North Shore Traction Co.....com.	100	4,000,000	4,000,000	5% S. A. & O.	85 87	Lancaster & Col. Electric Ry.....	100	87,500			
North Shore Traction Co.....pfd.	100	2,000,000	2,000,000	3% S. Oct.,	95 95 1/2	West End Street Railway.....	100				
West End Street Ry. Co.....com.	50	10,000,000	4,000,000	3% S. Oct.,	114 115	Louisville, Ky. —May 13:					
West End Street Ry. Co.....8% pfd.	50	1,000,000	6,400,000	4% S. Jan.,	179 1/2 179 3/4	Louisville Ry.....com.	100	4,000,000	3,500,000	1 1/2% S. April,	92 88
Boston Elevated R. R.....	100	10,000,000		2% S. Aug. 99,		Louisville Ry.....pfd.	100	2,500,000	2,500,000	2% S. Oct. 1,	112 118
Brooklyn N. Y. —May 13:						Minneapolis, Minn. —May 13					
Brooklyn City Ry.....	100	2,000,000	1,928,400		241 242	Twin City Rapid Transit.....com.	100	17,000,000	15,010,000	1 1/2% S. Oct.,	68 1/2 68 1/2
Brooklyn Rap. Transit Co., tr certif.....	100	43,000,000	43,000,000	7 1/2%	74 1/2 74 1/2	Twin City Rapid Transit.....7 1/2% pfd.	100	8,000,000	1,712,200	1 1/2% S. Oct.,	186 187
*Brooklyn Heights Railroad.....	100	200,000	200,000		107 109	Montreal, Canada. —May 13					
*Brooklyn City RR.....guar.	100	12,000,000	12,000,000	8% S. Q., Jan.,	237 239	Montreal Street Ry. Co.....	50	4,000,000	4,000,000	8% S. M. & N.	279 280
*Brooklyn, Queens Co. & Sub. RR.....	100	2,000,000	2,000,000	2 1/2% S. Nov., '99.	325 330	Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1 1/2% S. J. & J.	168 1/2 169 1/2
Coney Island & Brooklyn RR.....	100	2,000,000	1,884,200	2 1/2% S. Nov., '99.	325 330	Memphis Tenn. —May 13					
Kings County Elevated.....	100	4,750,000	4,750,000		82 83	Memphis Street Railway Co.....	100	500,000	500,000		35
Kings County Traction Co.....	100	4,500,000	4,500,000	1% July	82 83	New Haven, Conn. —May 13:					
Nassau Electric Railroad.....pfd.	50	6,000,000	6,000,000		82 83	Fair Haven & Westville RR.....	25	2,000,000	2,000,000	8% S. Sept.	89 41
*Atlantic Avenue Railroad.....	50	2,000,000	2,000,000		82 83	New Haven Street Railway Co.....	100	1,250,000	1,000,000	2 1/2% S. A., July	...
*Brooklyn, B. & W. E. Railroad.....	100	1,000,000	1,000,000		82 83	New Haven & Centerville.....	100	700,000	800,000		...
Buffalo N. Y. —May 13						Winchester Avenue RR.....	25	1,000,000	600,000		45 46
Buffalo & Niagara Falls Elec. Ry.....	100	1,250,000	1,250,000	1% Q. Dec., '99.	74 75	New Orleans, La. —May 13					
*Buffalo Railway Co.....	100	6,000,000	5,870,500	1% Q. Dec., '99.	99 100	Canal & Claiborne RR. Co.....	40	240,000	240,000	4% S. July,	...
Columbus O. —May 13						New Orleans & Carrollton RR.....	100	1,200,000	1,200,000	1 1/2% S. Q. Oct.	148 1/2 153
Columbus Street Railroad.....	100	8,000,000	8,000,000	1% Q. Feb.	88 88 1/2	New Orleans Traction Co new com.	100				22 1/2 24
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000		92 93	New Orleans Traction Co new pfd.	100				95 96
Charleston, S. C. —May 13						a Crescent City RR.....guar.	100	2,000,000	2,000,000	8% S. Jan.,	20 1/2 26
Charleston City Ry. Co.....	50	100,000	100,000	8% S.	...	b New Or. City & Lake RR.....guar.	100	2,000,000	2,000,000	4% S. Jan.,	...
Enterprise City RR. Co.....	25	1,000,000	250,000		...	Orleans Railroad.....	50	500,000	185,000	1 1/2% S. June,	...
Chicago, Ill. —May 13						St. Charles Street Railway.....	50	1,000,000	1,000,000	1 1/2% S. Oct.,	66 1/2 67
Chicago City Ry. Co.....	100	12,000,000	12,000,000	8% S. Q., Dec. 31,	250 260	New York —May 13:					
Chicago & South Side R. T. RR.....	100	10,828,800	10,828,800		18 1/2 19	Central Cross-town RR.....	100	600,000	600,000	2 1/2% S. Q.	255 260
Lake Street Elevated RR.....	100	10,000,000	10,000,000		81 1/2 81 1/2	c Christopher & 10th Sts. RR. guar.	100	650,000	650,000	2% S. Q. Oct.,	175 185
Metropolitan West Side Elev. Ry.....	100	15,000,000	7,600,000	Feb 28 1900.	81 1/2 81 1/2	Dry Dock, E. B. & W. & Battery RR.	100	1,200,000	1,200,000	1 1/2% S. Q. Nov.,	120 125
Met. West Side El., pfd.....	107	15,000,000	9,000,000		209 210	d Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000	2 1/2% S. Q. Feb., 1900.	159 1/2 160
North Chicago Street RR.....	100	10,000,000	6,600,000	8% S. Q., Jan.	197 200	e Bleeker St. & Fulton St. Ry. guar.	100	900,000	900,000	5% S. A., July,	80 87
a North Chicago City RR.....	100	500,000	249,900		108 109	f Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000	2 1/2% S. Q.	226 240
South Chicago City Railway.....	100	2,000,000	1,608,200	1 1/2% Q. Feb.	105 1/2 106	g Cen. Park, N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2 1/2% S. Q.	205 210
West Chicago St. RR. Co.....	100	20,000,000	18,189,000	1 1/2% Q. Feb.	14 14 1/2	h Eighth Avenue RR.....	100	1,000,000	1,000,000	2 1/2% S. Q.	393 405
Union Traction Ry. Co.....com.	100	1,250,000	624,900	5% S.	56 57	i 42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	4% S. Q.	392 402
Union Traction Co.....pref.	100	2,000,000	2,000,000	5% S.	56 57	j Ninth Avenue RR.....	100	800,000	800,000		198 201
Cincinnati, Ohio. —May 13:						k Sixteenth Avenue RR.....	100	2,000,000	2,000,000		384 405
Cincinnati Inc. Plane Ry.....com.	50	1,000,000	875,000	1% Feb.	...	l Twenty-third St. R. R. Co. guar.	100	600,000	600,000	4% S. Q.	400 419
Cincinnati Inc. Plane Ry.....pfd.	50	150,000	150,000	1% Feb.	...	m Second Avenue RR.....	100	2,500,000	1,862,000	2% S. Q., Jan.,	2 1/2 212
Cincinnati, Newport & Cov. St. Ry.	100	3,000,000	3,500,000	2% S. Feb.	124 1/2 125	n Third Avenue RR.....	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.	124 1/2 125 1/2
Cincinnati Street Ry. Co.....	50	18,000,000	14,000,000	1 1/2% Q., Jan.	124 1/2 125	o 42d St. Manhattan & St. Nich. Av.	100	2,500,000	2,500,000		65 76
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1 1/2% Q., Jan.	126 1/2 127	*Union (Huckleberry) Ry.....	100	2,000,000	2,000,000		190 200
Cleveland, Ohio. —May 13						Newark N. J. —May 13					
Akron, Bed. & Elev. Elec. Ry.....	100	1,000,000	1,000,000	3% S. Jan.	48 50	Consolidated Traction Co. of N. J....	100	15,000,000	15,000,000		67 1/2 68 1/2
Cleveland City Ry.....	100	8,000,000	7,600,000	3-5% S. Jan.	102 102 1/2	North Jersey Railway Co.....	100	6,000,000	6,000,000		20 1/2 21 1/2
Cleveland Electric Ry.....	100	12,000,000	12,000,000	3% S. Q., Oct.,	83 84 1/2	United Elec. Co. of New Jersey....	100	504,000	504,000	1 1/2% S. A.	25 1/2 26 1/2
Detroit, Mich. —May 13						Pittsburg, Pa. —May 13					
Detroit Citizens' Street Ry.....	100	2,000,000	1,250,000		100 100	Allegheny Traction Co.....	50	500,000	500,000		27 28
Fl. Wayne & Belle Isle Ry.....	100	1,200,000	1,200,000		175	a Consolidated Traction Co.....com.	50	15,000,000	15,000,000	2% S. Jan.,	24 24 1/2
Rapid Railway Co.....	100	250,000	250,000		90 100	b Consolidated Traction Co.....pfd.	50	9,478,850	9,478,850	8% S. Nov.	62 1/2 63
Detroit Electric Railway.....	100	1,000,000	1,000,000		100 110	c Central Traction Co.....	50	1,500,000	1,500,000	1 1/2% S. Nov.	78 1/2 78 1/2
Wyandotte & Detroit River Ry.....	100	250,000	200,000		100 110	d Citizens' Traction Co.....	50	8,000,000	8,000,000	6% S. A.	72 1/2 72 1/2
Dayton O. —May 13:						e Duquesne Traction Co.....	50	8,000,000	8,000,000	5% S. A.	...
City Railway Co.....com.	100	1,500,000	1,470,600	1 1/2% S. Q.	140 145	f Pittsburg Traction Co.....	50	2,500,000	2,500,000	8% S. Nov.	...
City Railway Co.....pfd.	100	600,000	600,000	1 1/2% S. Q.	170	g Federal St. & Pleasant Valley Ry.	25	1,400,000	1,400,000	3% S. July,	27 29
People's Street Railway.....	100	1,100,000	1,100,000		114 115	h Allegheny & Man. Trac. Co.....	25	8,000,000	8,000,000	2% S. Aug.	...
						i Pittsburg & West End Ry.....	50	1,500,000	1,500,000	1% S. Oct.	41 42 1/2
						j United Traction Co.....com.	50	8,000,000	8,000,000	5% S. A., June	...
						k United Traction Co.....pref.	50	8,000,000	8,000,000	J. & J.	18 1/2 18 1/2
										J. & J.	51 52

* Unlisted. † Ex-div.
 a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.
 b Leased to Boston Elevated Railroad Company.
 c Owned by Brooklyn Rapid Transit Company.
 d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
 e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn H. & C. Co.
 f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
 g Owned by Atlantic Ave. RR. and leased to Nassau system.
 h \$20 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; \$250 100 of stock owned by North Chicago Street Railroad Company.
 i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
 j 85% per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,100 of stock owned by West Chicago Street Railroad Company & Majority of stock owned by Chicago West Division Railway Company; 5% on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
 k Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex-div.
 a Leased to New Orleans Traction Company at 6% on stock.
 b Leased to New Orleans Traction Company at 8% on stock.
 c Leased to Central Cross-town Railroad at 8% on stock and interest on bonds.
 d Operating the former Met. Trac. system, that corporation having become extinct.
 e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
 f Leased to Houston, West Street & Pavonia Ferry—now Metropolitan Street Railway.
 g Leased to Metropolitan Street Ry. at 8% on stock until Oct. 1, 1897; thereafter 9%.
 h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1895, at \$215,000 per annum.
 i Leased to Metropolitan Street Railway for 18% on stock.
 j Leased to Met. St. Ry. for 99 years from April 24, 1892; 6% first 5 years, 8% thereafter.
 k Leased to Metropolitan Street Railway for \$145,000 per annum.
 l Leased to Metropolitan Street Railway for 18% on capital stock.
 m Controlled by Third Avenue Railroad by purchase.
 n Dividends of 1 1/2% yearly guaranteed by Consolidated Traction Company.
 o Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.
 p Leased to Consolidated Traction Company for 8% per annum on par value of stock.
 q Leased to Fort Pitt Traction Company for 6% on \$8,000,000 capital stock.
 r Leased to Consolidated Traction Company for 4% on capital stock.
 s Leased to Consolidated Traction Company for 7% on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Capital Stock.			Rate and Date of Last Div.	Bid.	Asked.	NAME.	Capital Stock.			Rate and Date of Last Div.	Bid.	Asked.
	Par	Authorized	Issued.					Par	Authorized	Issued.			
New Bedford Mass.—May 13	100	\$850,000	\$850,000	2% Feb.	160	165	Boston, Mass.—May 13	100	\$800,000	\$800,000	4% Q. Jan.	172	173
Union Street Railway Co.	100	850,000	850,000	2% Feb.	160	165	American Tel. & Tel. Co.	100	800,000	800,000	1% Q. Feb. 20,	87	87 1/2
Northampton, Mass.—May 13	100	800,000	225,000	4% A. June.	170	178	Erie Telegraph & Telephone Co.	100	10,894,800	10,804,800	\$1.50 p. sh. Feb.	189	189
Northampton Street Ry.	100	800,000	225,000	4% A. June.	170	178	New England Telephone Co.	100	10,894,800	10,804,800	\$1.50 p. sh. Feb.	189	189
Omaha, Neb.—May 13	100	5,000,000	5,000,000	8% A. and N.	55	65	New York.—May 13	100	14,000,000	14,000,000	1% Q. Q.	91	94
Omaha Street Ry.	100	5,000,000	5,000,000	8% A. and N.	55	65	American Telegraph & Cable Co.	100	6,500,000	6,500,000	1% Q. Q.	100	105
Paterson, N. J.—May 13	100	1,250,000	1,250,000	—	54	—	*Central & South Am. Tel. Co.	100	10,000,000	10,000,000	1% Q. Q.	178	175
Paterson Ry. Co.	100	1,250,000	1,250,000	—	54	—	*Commercial Cable Co.	100	1,000,000	1,000,000	1% Q. Q.	42	50
Providence, R. I.—May 13	100	8,000,000	8,000,000	3% Q. Oct.	110	111	Franklin Tel. Co.	100	5,000,000	4,800,000	1% Q. Feb.,	116	118
United Traction & Electric Co.	100	8,000,000	8,000,000	3% Q. Oct.	110	111	Erie Telegraph & Telephone Co.	100	5,000,000	4,800,000	1% Q. Feb.,	116	118
Philadelphia.—May 13	50	2,000,000	1,770,000	2% Dec.	28	24	*Gold & Stock Tel. Co. guar. 6%	100	5,000,000	4,800,000	1% Q. Feb.,	116	118
Fairmount Park Trans. Co.	50	1,968,100	1,968,100	2% Dec.	28	24	*International Ocean Tel. Co. guar. 6%	100	5,000,000	4,800,000	1% Q. Feb.,	116	118
Hestonville, Man. & Fairmount.	50	1,968,100	1,968,100	2% Dec.	28	24	Mexican Telephone Co.	100	5,000,000	4,800,000	1% Q. Feb.,	116	118
Hestonville, Man. & Fairmount.	50	1,968,100	1,968,100	2% Dec.	28	24	*New York & New Jersey Tel. Co.	100	5,000,000	4,800,000	1% Q. Feb.,	116	118
Fairmount Pk. & Had. Pass. Ry.	50	1,968,100	1,968,100	2% Dec.	28	24	*Pacific & Atlantic Tel. Co. guar. 4%	100	5,000,000	4,800,000	1% Q. Feb.,	116	118
Union Traction Co.	50	1,968,100	1,968,100	2% Dec.	28	24	*Postal Telegraph Cable Co.	100	5,000,000	4,800,000	1% Q. Feb.,	116	118
Electric Traction Co.	50	1,968,100	1,968,100	2% Dec.	28	24	*Sout'n & Atlantic Tel. Co. guar. 5%	100	5,000,000	4,800,000	1% Q. Feb.,	116	118
City of Philadelphia Passenger Ry.	50	1,968,100	1,968,100	2% Dec.	28	24	*Commercial Union Telegraph Co.	100	5,000,000	4,800,000	1% Q. Feb.,	116	118
Frankford & Southwark Pass. Ry.	50	1,968,100	1,968,100	2% Dec.	28	24	Western Union Telegraph Co.	100	5,000,000	4,800,000	1% Q. Feb.,	116	118
Lehigh Avenue Ry. Co.	50	1,968,100	1,968,100	2% Dec.	28	24	*Div. guar. by Postal Tel. Co.	100	5,000,000	4,800,000	1% Q. Feb.,	116	118
Lombard & South Street Ry.	50	1,968,100	1,968,100	2% Dec.	28	24	Miscellaneous.—May 13	100	8,000,000	8,000,000	—	—	—
Second & Third Streets Ry.	50	1,968,100	1,968,100	2% Dec.	28	24	American Dist. Tel. (Phila.)	100	8,000,000	8,000,000	—	—	—
People's Traction Co.	50	1,968,100	1,968,100	2% Dec.	28	24	Bell Tel. Co. (of Canada)	100	8,000,000	8,000,000	—	—	—
Germantown Passenger Ry.	50	1,968,100	1,968,100	2% Dec.	28	24	Chesapeake & Potomac Tel. Co.	100	8,000,000	8,000,000	—	—	—
Green & Coates Passenger Ry.	50	1,968,100	1,968,100	2% Dec.	28	24	Chicago Telephone Co.	100	8,000,000	8,000,000	—	—	—
People's Passenger Ry. com.	50	1,968,100	1,968,100	2% Dec.	28	24	Central Dist. Prtg. & Tel. Co. (Phg.)	100	8,000,000	8,000,000	—	—	—
People's Passenger Ry. pfd.	50	1,968,100	1,968,100	2% Dec.	28	24	Empire & Bay States Telephone Co.	100	8,000,000	8,000,000	—	—	—
Philadelphia Traction Co.	50	1,968,100	1,968,100	2% Dec.	28	24	Hudson River Telephone Co.	100	8,000,000	8,000,000	—	—	—
Catherine & Bainbridge St.	50	1,968,100	1,968,100	2% Dec.	28	24	*Northwestern Telephone Co. guar.	100	8,000,000	8,000,000	—	—	—
Continental Pass. Ry. guar.	50	1,968,100	1,968,100	2% Dec.	28	24	Providence (R. I.) Tel. Co.	100	8,000,000	8,000,000	—	—	—
Empire Passenger Ry. Co.	50	1,968,100	1,968,100	2% Dec.	28	24	Southern New Eng. Tel. Co.	100	8,000,000	8,000,000	—	—	—
Philadelphia City Pass. Ry.	50	1,968,100	1,968,100	2% Dec.	28	24							
Philadelphia & Gray's Ry. RR.	50	1,968,100	1,968,100	2% Dec.	28	24							
Bridge Avenue Passenger Ry.	50	1,968,100	1,968,100	2% Dec.	28	24							
Philadelphia & Darr Ry. guar.	50	1,968,100	1,968,100	2% Dec.	28	24							
15th & 19th Sts. Pass. Ry. guar.	50	1,968,100	1,968,100	2% Dec.	28	24							
Thirteenth & 15th Sts. Pass. Ry.	50	1,968,100	1,968,100	2% Dec.	28	24							
Union Passenger Ry. Co.	50	1,968,100	1,968,100	2% Dec.	28	24							
West Philadelphia Pass. Ry.	50	1,968,100	1,968,100	2% Dec.	28	24							
Rochester, N. Y.—May 13	100	5,000,000	5,000,000	—	19	21							
Rochester Railway Co.	100	5,000,000	5,000,000	—	19	21							
Reading, Pa.—May 13	100	1,000,000	1,000,000	Semi-an. Jan. & J.	24	26							
Reading Traction Co.	100	1,000,000	1,000,000	Semi-an. Jan. & J.	24	26							
City Passenger Ry.	50	850,000	850,000	Jan., '98.	188	70							
East Reading Electric Ry.	50	1,000,000	1,000,000	Jan., '98.	188	70							
St. Louis Mo.—May 13	100	800,000	150,000	—	—	—							
Fourth Street & Arsenal Ry.	100	800,000	150,000	—	—	—							
Jefferson Avenue Ry. Co.	100	800,000	150,000	—	—	—							
Lindell Ry.	100	800,000	150,000	—	—	—							
National Railway Co.	100	800,000	150,000	—	—	—							
Cass Avenue & Fair Grounds.	100	800,000	150,000	—	—	—							
City of St. Louis RR.	100	800,000	150,000	—	—	—							
Missouri RR.	100	800,000	150,000	—	—	—							
People's RR. Co.	100	800,000	150,000	—	—	—							
United Electric Ry.	100	800,000	150,000	—	—	—							
United Electric Ry. 5% pref.	100	800,000	150,000	—	—	—							
St. Louis & Suburban Ry.	100	800,000	150,000	—	—	—							
Union Depot RR.	100	800,000	150,000	—	—	—							
San Francisco, Cal.—May 13	100	1,000,000	600,000	50c. monthly.	117	119							
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119							
Geary Street Park & Ocean RR.	100	1,000,000	600,000	50c. monthly.	117	119							
Market Street Ry.	100	1,000,000	600,000	50c. monthly.	117	119							
Presidio & Ferries RR.	100	1,000,000	600,000	50c. monthly.	117	119							
Scranton Pa.—May 13	100	5,000,000	2,500,000	—	29	30							
Scranton Railway Co.	100	5,000,000	2,500,000	—	29	30							
Scranton & Carbondale Trac. Co.	100	5,000,000	2,500,000	—	29	30							
Scranton & Pittston Traction Co.	100	5,000,000	2,500,000	—	29	30							
Springfield Ill.—May 13	100	750,000	750,000	—	—	—							
Springfield Consolidated Ry.	100	750,000	750,000	—	—	—							
Springfield O.—May 13	100	1,000,000	1,000,000	—	—	—							
Springfield Street Ry.	100	1,000,000	1,000,000	—	—	—							
Springfield, Mass.—May 13	100	1,200,000	1,166,700	8% A.	207	212							
Springfield Street Ry.	100	1,200,000	1,166,700	8% A.	207	212							
Toronto Canada.—May 13	100	6,000,000	6,000,000	1% Q. 8.	108 1/2	109 1/2							
Toronto Street Ry.	100	6,000,000	6,000,000	1% Q. 8.	108 1/2	109 1/2							
Montreal Street Railway Co.	100	4,000,000	4,000,000	1% Q. 8.	279	280							
Washington, D. C.—May 13	50	500,000	500,000	—	—	—							
Balt. Ry. Co.	50	500,000	500,000	—	—	—							
Capital Traction Co.	100	12,000,000	12,000,000	65c. per sh. Oct.	102 1/2	102 1/2							
Columbia Ry. Co.	50	400,000	400,000	6% A.	85	85							
Washington & Soldiers' Home Ry.	50	707,000	652,000	—	20	21							
Georgetown & Tenallytown Ry.	50	200,000	200,000	—	20	21							
Metropolitan RR. Co.	50	1,000,000	458,900	2% Q.	—	—							
Worcester, Mass.—May 13	100	8,000,000	8,000,000	—	87 1/2	85							
Worcester Traction Co.	100	8,000,000	8,000,000	—	87 1/2	85							
Worcester Traction Co. 5% pfd.	100	2,000,000	2,000,000	5% Q. Feb.,	87 1/2	85							
Worcester & Suburban Street Ry.	100	550,000	542,500	4% Q.	—	—							
Wilkesbarre, Pa.—May 13	100	5,000,000	5,000,000	1% Jan.	25	29							
Wilkesbarre & Wyoming Val Trac.	100	5,000,000	5,000,000	1% Jan.	25	29							

* Unlisted. † Paid in. ‡ Full paid. § Outstanding. ¶ Ex-div.
 a Leased to Hestonville, Man. & Fairmount Passenger Ry. for 6% on stock per annum.
 b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
 c Practically all shares owned by Union Traction Company.
 d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
 e Leased to Electric Traction Company.
 f Controlled by Frankford & Southwark Passenger Railway.
 g Leased to People's Passenger Railway at \$5 per share.
 h Majority of stock owned by People's Traction Company.
 i Leased to Union Traction Company.
 j Lease transferred to Union Traction Company.
 k Leased to Union Traction Company at a rental of \$10,000 per annum in 1896-7-8-9-10, \$20,000 in 1899-1900 and \$30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.
 l Dividend of 10% guaranteed by Reading Traction Company.
 m Dividend of 6% guaranteed by Reading Traction Company.
 n Leased and operated by the Scranton Railway Co. formerly Reading Traction Co.

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

Boston, Mass.—May 13						
Fort Wayne Electric trust receipts..	25	.....	.....	.....	115	126
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	.....	119	120
*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1% % Oct., '98.	8	12
Edison Ore Milling Co.....com.	100	.....	.....	.....	.....	.....
Electric Vehicle Co.....com.	100	.....	.....	.....	.....	.....
General Electric Co. (old).....com.	100	40,000,000	30,460,000	2 % Q., Aug., 1898.	224 1/2	224 1/2
General Electric Co. (new).....com.	100	18,276,000	18,276,000	1% % Q., Apr., 1901	224 1/2	224 1/2
Interior Conduit & Insulation Co..	100	1,000,000	1,000,000	.....	41	.....
Kings Co. El. L. & P. Co.....com.	100	2,500,000	2,500,000	A. & O.	110	125
Pittsburg, Pa.—May 13						
Allegheny County Light Co.....	100	500,000	500,000	J. & J.	168	173
East End Electric Light Co.....	50	800,000	800,000	Q	.....	.....
Philadelphia, Pa.—May 13						
Edison Electric Light Co.....	100	2,000,000	.....	.....	144	144 1/2
*Electric Storage Battery Co..com.	100	8,500,000	.....	.....	65	66
*Electric Storage Battery Co..pfd.	100	5,000,000	.....	.....	63	67
Northern Elec. Light & Power Co..	10	550,000	550,000	.....	18	18 1/2
Southern Elec. Light & Power Co..	10	187,500	187,500	.....	80	.....
Miscellaneous.—May						
Bridgeport (Conn.) Elec. Lt. Co....	25	500,000	.....	.....	47	48
Missouri-Edison (St. Louis).....com.	25	.....	.....	.....	20	21
Eddy Electric Mfg. Co.....	25	.....	.....	.....	9	12
Hartford (Conn.) Elec. Light Co....	100	850,000	.....	.....	80	191
Hartford (Conn.) Lt. & Power Co....	25	175,000	.....	.....	6	19
New Haven (Conn.) Elec. Lt. Co....	100	100,000	.....	.....	195	.....
Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	.....	2 % Q., Oct.,	108	104
Rhode Island Elec. Protec. Co.....	100	.....	.....	.....	118 1/2	101
Royal Elec. Co. (Montreal).....	100	1,220,000	.....	2% Q	20	251
Toronto (Canada) Elec. Light Co....	100	1,085,000	1,085,000	1% % Q	185 1/2	187
Thomson-Houston Welding Co.....	100	.....	.....	8 % S, Dec. 1,	105	100
Woonsocket (R. I.) Electric Co....	100	.....	.....	.....	105	100

BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

NAME.		Amount.		Due	Interest periods.	Bid.	Asked.	NAME.		Amount.		Due	Interest periods.	Bid.	Asked.
Authorized.	Issued.	Authorized.	Issued.												
Albany N. Y.															
Date of Quotation—May 13, 1901															
The Albany Ry. Co.....Cons. mtg. 5s	\$500,000	427,500	1940	J. & J.	117 1/4	.....	.....	Canal & Claiborne RR.....cons mtg. 6s	\$150,000	\$150,000	1912	M. & N.	.....	.....	.....
The Albany Ry. Co.....Gen. mtg. 5s	750,000	575,000	1947	M. & N.	118 1/4	.....	.....	Oreocent City RR.....1st mtg. 6s	5,000,000	8,000,000	1889	M. & N.	105 1/4	.....	.....
Watervliet Turnpike & RR. 1st mtg. 6s	850,000	850,000	1919	M. & N.	112 1/4	.....	.....	New Orleans City RR.....1st mtg. 6s	415,500	899,000	1908	J. & D.	108	112	118
Watervliet Turnpike & RR. 2d mtg. 6s	150,000	150,000	1919	M. & N.	112 1/4	127	117	N. Orleans City & Lake RR. 1st mtg. g. 5s	5,000,000	2,599,500	1948	J. & J.	112	.....	.....
Troy City Railway Co.....1st 5s	.....	.....	1942	.....	116	.....	.....	N. Orleans & Carrollton RR. 2d mtg. g. 6s	800,000	850,000	1807	F. & A.	.....	.....	.....
Interest guar. by Albany Ry. Co. Principal and interest guar. by Albany Ry. Co.															
Baltimore Md.															
Date of Quotation—May 13, 1901															
United Electric Ry. Co.....1st mtg. g. 4s	88,000,000	18,000,000	1949	M. & S.	108	108 1/2	.....	Atlantic Ave. (Brooklyn).....Imp. g. 5s	1,500,000	1,800,000	1984	J. & J.	95	.....	.....
.....Income 4s	14,000,000	.....	1949	J. & D.	74 1/4	75	.....	Atlantic Av. (Brooklyn).....1st gen. mtg. 5s	759,000	759,000	1909	M. & S.	107 1/4	110	116
Baltimore City Pass. Ry. 1st mtg. g. 5s	2,000,000	2,000,000	1911	M. & N.	118 1/4	.....	.....	Atlantic Av. (Brooklyn).....Cons. mtg. 5s	8,000,000	1,966,000	1981	A. & O.	115	128	126
Baltimore Traction Co.....1st mtg. 5s	1,800,000	1,800,000	1929	M. & N.	119	120	.....	Bro'dway & 7th Ave. 1st cons. mtg. g. 5s	12,500,000	7,650,000	1948	J. & D.	104	104 1/4	108 1/4
Baltimore Trac. Co. Ext'n. & Imp. g. 6s	1,290,000	1,290,000	1901	M. & S.	104 1/4	.....	.....	Broadway & 7th Ave.....1st mtg. 5s	1,500,000	1,500,000	1904	J. & D.	108	110	110 1/4
Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121 1/4	.....	Broadway & 7th Ave.....2d mtg. 5s	500,000	500,000	1914	J. & J.	115	117	118
Bal. Trac. Co. Coll. Trust. 1st mtg. g. 5s	750,000	.....	1900	J. & J.	101	.....	.....	Broadway Surface.....1st mtg. 5s	1,125,000	1,125,000	1924	.....	105	106	106 1/4
Bal. Trac. Co. Coll. Trust. 1st mtg. g. 5s	750,000	.....	1900	J. & J.	101	.....	.....	Broadway Surface.....2d mtg. 5s	1,000,000	1,000,000	1905	.....	116	117	118
Baltimore Traction Co. Convertible 5s	800,000	.....	1906	N. & M.	102 1/4	.....	.....	Brooklyn City RR. Co. 1st cons. mtg. 5s	6,000,000	6,000,000	1941	J. & J.	115	116	117
Central Pass. Ry. Co.....1st mtg. 6s	96,000	117,000	1912	J. & J.	.....	.....	.....	Brooklyn City & Newtown.....1st mtg. 5s	2,000,000	2,000,000	1889	J. & J.	101	.....	.....
Central Pass. Ry. Co. Cons. mtg. g. 5s	604,000	880,000	1922	M. & N.	119	121	.....	Brooklyn Bath & W. E. RR. Gen. mtg. 5s	1,000,000	448,000	1988	J. & J.	104	.....	.....
Central Pass. Ry. Co. Cons. mtg. g. 5s	604,000	880,000	1922	M. & N.	119	121	.....	Brooklyn Heights RR.....1st mtg. 5s	250,000	250,000	1941	A. & O.	104	.....	.....
City & Suburban Ry.....1st mtg. g. 5s	8,000,000	8,000,000	1922	J. & D.	116	117	.....	Brooklyn, Q's Co. & Sub'n.....1st mtg. 5s	8,500,000	8,500,000	1941	J. & J.	117	.....	.....
Lake Roland Elev.....1st mtg. 5s	1,000,000	1,000,000	1942	M. & S.	117	.....	.....	Brooklyn, Q's Co. & Sub'n.....1st cons. 5s	4,500,000	2,750,000	1941	M. & N.	107	.....	.....
All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.															
Boston Mass.															
Date of Quotation—May 13, 1901															
Lynn & Boston RR.....1st mtg. g. 5s	5,879,000	3,709,000	1924	J. & D.	114	115	.....	Brooklyn Rapid Transit.....gold 5s	7,000,000	5,181,000	1945	.....	108 1/4	100 1/4	100 1/4
West End Street Ry.....Deben. g. 5s	8,000,000	3,000,000	1902	M. & N.	104 1/4	106	.....	Bleecker St. & Fulton Ferry RR. 1st mtg. 7s	700,000	700,000	1900	.....	98 1/4	100 1/4	100 1/4
West End Street Ry.....Deben. g. 4 1/2s	2,000,000	2,000,000	1914	M. & S.	112	.....	.....	Cent Pk. N. & E. R. RR. 1st cons. mtg. 4s	1,200,000	1,200,000	1902	J. & D.	107	109	109
†\$1,674,000 in escrow to retire outstanding bonds of absorbed companies.															
Charleston S. C.															
Date of Quotation—May 13, 1901.															
Enterprise Street RR.....1st mtg. 5s	800,000	47,000	1908	J. & J.	.....	.....	.....	Central Crosstown RR.....1st mtg. 6s	280,000	250,000	1922	M. & N.	125	.....	.....
Charleston City Ry.....1st mtg. 5s	850,000	.....	.....	J. & J.	106	.....	.....	Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1908	J. & J.	101	108	108
†Controlled by Charleston St. Ry. Co.															
Chicago Ill.															
Date of Quotation—May 13, 1901															
Chicago City Ry.....1st mtg. 4 1/2s	6,000,000	4,619,500	1901	J. & J.	101 1/4	2 1/4	.....	D. Dock, E. B'd'y & Bat'y RR. gen. mtg. g. 5s	1,000,000	980,000	1902	J. & D.	117	120	105
Chicago Passenger Ry.....1st mtg. 6s	1,000,000	800,000	1929	J. & D.	.....	.....	.....	Dry Dock, E. B'd'y & Bat'y RR. scrip 5s	100,000	1,100,000	1914	F. & A.	102	108	108
Chicago Passenger Ry.....Cons. mtg. 6s	7,500,000	7,500,000	1929	A. & O.	.....	.....	.....	Eight Ave. RR. Co.....Cert. Indeb't. 6s	200,000	1,000,000	1914	F. & A.	108	.....	.....
Chicago & So. Side R. T. 1st mtg. g. 5s	1,500,000	750,000	1907	J. & J.	.....	.....	.....	42d St., Man. & St. Nich. Av. 1st mtg. 5s	1,500,000	1,500,000	1915	J. & J.	82	.....	.....
Chicago & So. Side R. T. 2d mtg. 4 1/2s	1,500,000	4,040,000	1922	J. & J.	108 1/4	109	.....	42d St., Man. & St. N. Av. 2d mtg. inc. 5s	5,000,000	5,000,000	1908	M. & S.	124	125	125
Chicago West Div. Ry.....1st mtg. 4 1/2s	4,040,000	8,781,200	1928	J. & J.	.....	.....	.....	Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s	12,500,000	19,500,000	1907	F. & A.	120	.....	.....
Lake Street Elevated RR. 1st mtg. g. 5s	7,574,000	15,000,000	1942	F. & A.	96	96 1/2	.....	Metropolitan St. Ry. Co. g. m. cl. tr. g. 5s	1,600,000	1,600,000	1909	M. & N.	120	121	121
Metrop. W. Side Elev. Ry. 1st mtg. 5s	15,000,000	8,171,000	1906	J. & J.	106	.....	.....	Second Avenue Ry. Gen. cons. mtg. 5s	800,000	800,000	1909	J. & J.	118 1/4	109	109
North Chicago St. RR.....1st mtg. 5s	8,171,000	8,000,000	1911	J. & J.	.....	.....	.....	Second Avenue Ry. Deb. 5s	1,500,000	1,500,000	1922	J. & J.	116	117	117
North Chicago St. RR. Cert. Indeb't. 5s	500,000	500,000	1907	J. & J.	.....	.....	.....	Stelway Ry. (L. I.).....1st mtg. g. 5s	850,000	850,000	1919	.....	110 1/4	112 1/4	112 1/4
North Chicago City Ry.....1st mtg. 5s	2,500,000	2,800,000	1927	M. & N.	108	.....	.....	South Ferry RR. Co.....1st mtg. 5s	5,000,000	5,000,000	1987	J. & J.	.....	128 1/4	.....
North Chicago City Ry.....consol. 4 1/2s	4,100,000	8,989,000	1928	M. & N.	111	.....	.....	Third Avenue RR.....1st mtg. g. 5s	.....	.....	1909	J. & J.	.....	.....	.....
West Chicago St. RR.....1st mtg. 5s	2,700,000	700,000	1911	J. & D.	101	102	.....	Twenty-third Street Ry.....1st mtg. 5s	150,000	150,000	1906	J. & J.	106	108	108
West Chicago St. RR. Deben. 6s	12,500,000	6,000,000	1906	.....	100 1/2	107	.....	Twenty-third Street Ry. Deb. 5s	2,000,000	2,000,000	1942	F. & A.	118	118	118
West Chicago St. RR. Cons. mtg. g. 5s	1,500,000	1,500,000	1909	F. & A.	.....	.....	.....	Union (Huckleberry) Ry.....1st mtg. 5s	500,000	500,000	1948	J. & J.	110	114	114
W. Chicago St. RR. Tunnel.....1st mtg. 5s	.....	.....	.....	.....	.....	.....	.....	†\$1,085,000 in escrow to retire gen. mtg. bonds.							
†Redeemable at option on 60 da. notice.	.....	.....	.....	.....	.....	.....	.....	†\$4,850,000 in escrow to retire maturing obligations.							
†Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.	.....	.....	.....	.....	.....	.....	.....	†\$552,000 in escrow to retire 1st and 2d mtg. bonds.							
†Subject to call after Oct. 1, 1899, at \$110 and interest.	.....	.....	.....	.....	.....	.....	.....	†In treasury, \$80,000.							
†Assumed by W. Chi. RR. Co., lessee	.....	.....	.....	.....	.....	.....	.....	†Guar. by Union Ry. Co.							
†Int. guar. by W. Chicago St. RR. Co.	.....	.....	.....	.....	.....	.....	.....	Toronto Canada.							
Date of Quotation—May 13, 1901															
Cin. New. & Cov. St. Ry. 1st Cons. mtg. g. 5s	8,000,000	2,500,000	1929	J. & J.	114 1/4	115	.....	Montreal St. Ry.....1st mtg. 5s	2,500,000	800,000	1908	M. & P.	.....	.....	.....
†Mt. Adams & Eden Pk In. 1st mtg. 5s	46,000	46,000	1900	A. & O.	114	104	.....	Toronto St. Ry.....1st mtg. g. 4 1/2s	4,550,000	2,200,000	1921	M. & P.	.....	.....	.....
†Mt. Adams & Eden Pk In. 1st mtg. 5s	100,000	100,000	1905	A. & O.	108 1/4	.....	.....	†\$85,000 per m. single track authorized.							
†Mt. Adams & Eden Pk In. Cons. mtg. 5s	581,090	581,000	1906	M. & S.	121 1/4	122 1/4	.....	†\$600,000 in escrow to retire 6s due in 1901.							
So. Cov. & Cin. St. Ry.....1st mtg. 6s	250,000	250,000	1912	M. & S.	182 1/4	187	.....	Philadelphia.							
So. Cov. & Cin. St. Ry.....2d mtg. 6s	400,000	400,000	1912	J. & J.	.....	.....	.....	Date of Quotation—May 13, 1901							
†Assumed by the Cin. St. Ry. Co.															
†\$250,000 reserved to retire 1st mtg. bds.	.....	.....	.....	.....	.....	.....	.....	Continental Pass. Ry.....1st mtg. 6s	850,000	810,000	1909	J. & J.	.....	.....	.....
Cleveland O.															
Date of Quotation—May 13, 1901															
Brooklyn Street RR. Co.....1st mtg. 6s	600,000	600,000	1908	M. & S.	106 1/4	107	.....	Empire Pass. Ry.....1st mtg. 7s	800,000	200,000	1900	J. & J.	.....	.....	.....
Cin. New't & Cov. St. Ry. Cons. mtg. 5s	8,000,000	2,500,000	1922	J. & J.	114 1/4	114 1/4	.....	Greene & Coates St. Ry.....1st mtg. 5s	100,000	100,000	1898	J. & J.	.....	.....	.....
Cleveland City Cable Ry.....1st mtg. 5s	2,000,000	2,000,000	1909	J. & J.	106 1/4	107	.....	Lombard & So. St. Pass. Ry.....1st mtg. 6s	150,000	.....	1901	.....	.....	.....	.....
Cleveland Electric Ry. Co. 1st mtg. g. 5s	8,500,000	1,249,000	1918	M. & S.	106	107	.....	People's Pass. Ry.....1st mtg. 7s	250,000	250,000	1905	J. & J.	.....	.....	.....
Columbus (O.) Cent. Ry.....1st mtg. g. 5s	1,500,000	1,500,000	1918	M. & N.	.....	.....	.....	People's Pass. Ry.....2d mtg. 5s	500,000	458,000	1911	J. & J.	.....	.....	.....
allent Cleveland RR.....1st mtg. 5s	1,000,000	1,000,000	1910	M. & S.	.....	107 1/4	.....	People's Pass. Ry.....Cons. mtg. 5s	1,125,000	897,000	1912	M. & S.	.....	.....	.....
Pt. Wayne (Ind.) Elec. Ry. 1st mtg. g. 6s	600,000	.....	1922	M. & N.	.....	.....	.....	People's Pass. Ry.....Stk. tra. cert. g. 4s	5,698,210	.....	1948	.....	.....	.....	.....
Lorain (O.) Street Ry.....1st mtg. 6s	700,000	200,000	1915	J. & J.	.....	.....	.....	Phila. City Passenger Ry. 1st mtg. 5s	200,000	200,000	1910	J. & J.	.....	.....	.....
St. Ry. Co., Grand Rapids.....1st mtg. 5s	600,000	600,000	1912	J. & D.	.....	.....	.....	Philadelphia Trac. Co. Coll. tr. g. 4s	1,800,000	1,018,000	1908	A. & O.	.....	.....	.....
†\$1,900,000 in escrow to retire bonds of absorbed companies, marked a.															
Interest guar. by Cons. St. Ry. Co.															
Detroit, Mich.															
Date of Quotation—May 13, 1901															
Detroit Citizens' St. Ry.....1st mtg. 5s	7,000,000	8,885,000	1905	A. & O.	.....	102 1/2	.....	Thirteenth & 15th St. Ry.....1st mtg. 7s	100,000	100,000	1911	A. & O.	.....	.....	.....

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bid.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—May 13 1901						
Jefferson Avenue Ry.....1st mtg. 5a.	270,000	270,000	1908	M. & N.	102	118
Lindell Ry. Co.....1st mtg. 5a.	1,800,000	1,800,000	1911	F. & A.	107	118
Missouri RR. Co.....1st mtg. 5a.	1,000,000	700,000	1916	M. & S.	105	106
Mound City RR. Co.....1st mtg. 5a.	400,000	800,000	1910	A. & O.	104½	105½
People's RR. Co.....1st mtg. 5a.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 7a.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 5a.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric.....1st mtg. 5a.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 5a.	2,000,000	2,000,000	1900	M. & N.	99½	100½
St. Louis & Sub. Ry.....1st mtg. 5a.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5a.	800,000	800,000	.....	.....	80	84
Southwestern Electric Ry.....Cons. mtg. 5a.	500,000	500,000	1909	M. & N.	106	108
Taylor Avenue St. Ry.....1st mtg. 5a.	500,000	500,000	1918	J. & J.	116½	117½
Union Depot RR. Co.....1st cons. mtg. 5a.	1,091,000	1,091,000	1900	A. & O.	100	106½
Union Depot RR. Co.....Cons. mtg. 5a.	8,500,000	1,787,000	1918	J. & J.	121	122
Controlled by St. Louis RR. Co.						
Controlled by Union Depot RR. Co.						
Controlled by Lindell RR. Co.						
\$200,000 in escrow to retire 1st & 2d mtg.						
\$500,000 in escrow.						
\$200,000 in escrow to retire 1st mtg. bds.						
San Francisco Cal.						
Date of Quotation—May 13 1901.						
California St. Cable RR.....1st mtg. 5a.	1,000,000	900,000	1915	J. & J.	114	117
Ferris & Cliff House Ry.....1st mtg. 5a.	650,000	650,000	1914	M. & S.	.....	117
Geary St. Park & Ocean RR.....1st mtg. 5a.	1,000,000	671,000	1921	A. & O.	.....	96
Market St. Cable Ry. Co.....1st mtg. 5a.	8,000,000	8,000,000	1918	J. & J.	126½	.....
Metropolitan Ry. Co.....1st mtg. 5a.	200,000	.....	.....	.....	.....	.....
Omnibus Cable Co.....1st mtg. 5a.	2,000,000	2,000,000	1918	A. & O.	126½	.....
Park & Cliff House RR.....1st mtg. 5a.	850,000	850,000	1912	J. & J.	105½	107
Park & Ocean RR.....1st mtg. 5a.	250,000	250,000	1914	J. & J.	115	.....
Powell St. Ry.....1st mtg. 5a.	700,000	700,000	1912	M. & S.	.....	126
Butter St. Ry. Co.....1st mtg. 5a.	1,000,000	900,000	1918	M. & N.	.....	.....
Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—May 13 1901						
Belt Ry. Co.....Cons. mtg. 5a.	800,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 5a.	800,000	500,000	1914	A. & O.	123	.....
Washington & Soldiers' Home.....1st mtg. 5a.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 5a.	500,000	500,000	1901	J. & J.	.....	.....
\$500,000 in escrow to retire 1st mtg. bds.						
Miscellaneous.						
Date of Quotation—May 13, 1901						
Bridgeport Traction Co.....1st mtg. 5a.	2,000,000	1,088,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 5a.	5,000,000	8,548,000	1981	F. & A.	118	.....
Chicopee St. Ry. (Ind. Pol.) 1st cons. m. 5a.	4,000,000	8,000,000	1988	M. & N.	104	105
Croton St. Ry. (Buffalo) 1st mtg. 5a.	8,000,000	2,888,000	1982	M. & N.	112	118
Columbus (O.) St. Ry.....1st cons. g. 5a.	8,000,000	2,261,000	1982	J. & J.	116	.....
Consolidated Traction (N. J.) 1st mtg. 5a.	15,000,000	18,988,000	1988	J. & D.	111½	111½
Croton St. Ry. (Colu.) 1st mtg. 5a.	2,000,000	573,000	1988	J. & D.	115	115½
Denver City Cable Ry.....1st mtg. 5a.	4,000,000	8,800,000	1920	J. & J.	20	85
Denver Con. Tram'y Co.....Cons. m. g. 5a.	4,000,000	922,000	1988	A. & O.	80	86
Louisville (Ky.) Ry.....1st cons. mtg. g. 5a.	8,000,000	4,981,000	1919	J. & J.	119	119½
Minneapolis St. Ry. 1st cons. mtg. g. 5a.	5,000,000	4,050,000	1919	J. & J.	110½	110½
No. Hudson Co. Ry. (N. J.) Cons. mtg. 5a.	2,000,000	2,878,000	1928	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.) 2d mtg. 5a.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.) Deb. 5a.	500,000	489,000	1902	F. & A.	.....	.....
Peterson (N. J.) Ry.....Cons. mtg. g. 5a.	1,250,000	1,000,000	1981	J. & D.	.....	.....
Rochester (N. Y.) Ry.....1st mtg. 5a.	8,000,000	2,000,000	1980	A. & O.	.....	.....
St. Paul City Ry.....Cons. g. 5a.	5,500,000	4,298,000	1987	.....	106½	106
St. Paul City Ry.....Deb. g. 5a.	1,000,000	1,000,000	1900	.....	108	.....
\$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
\$200,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
\$100,000 in escrow to retire bonds of C. St. RR. Co.						
\$100,000 in treasury.						
\$200,000 reserved to redeem prior liens.						
\$200,000 in escrow.						
*With Int.						

*With int'res

ELECTRIC LIGHT AND ELECTRIC MFG. COs

Boston, Mass.						
Date of Quotation—May 13, 1901.						
Delaware Gas & L. Co.....1st m. 5a. g.	800,000	800,000	.....	J. & J.	106	106
Edison Elec. Illuminating Co., Boston.....	2,038,000	.....	.....	Quar.	187	.....
General Electric Co., gold coup. deb. 5a.	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa.						
Date of Quotation—May 13 1901						
Allegheny County Light Co.....5a.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Scrip 5a.	186,570	.....	.....	M. & S.	.....	.....
Miscellaneous. —(May 13, 1901.)						
Edison El. Ilg. Co. (N. York) 1st m. 5a.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilg. Co. (N. Y.) con. m. g. 5a.	15,000,000	2,188,000	1998	.....	124	.....
Edison Elec. Ilg. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122½	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. L. & Pow. Co. 1st mtg. 5a.	2,500,000	.....	1987	A. & O.	100	105
Kings Co. El. L. & Pow. Co. pur. money 5a.	5,176,000	.....	1997	A. & O.	120	122
Milwaukee El. Ry & L. Co. 1st con. g. 5a.	8,000,000	.....	.....	F. & A.	102½	.....
United Elec. Light & Power Co. (N. Y.).....	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—May 13 1901.						
American Bell Telephone.....5a.	.....	.....	1908	F. & A.	100%	101
Northwestern Telegraph Co.....5a.	.....	.....	.....	.....	114	115
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 5a.	.....	.....	1911	J. & D.	108	106
Chesapeake & Potomac Teleph. Co.....5a.	.....	.....	.....	.....	.....	.....

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—May 13 1901						
American Electric Heating.....7a	500,000	500,000	.....	.....	.....	25
Armstrong & Sims Engine Co.....5a.	.....	.....	.....	.....	.....	.....
Barnes & Smith Car Co.....5a.	.....	.....	1942	J. & J.	106	107
Carborundum Mfg Co.....5a.	.....	.....	1904	J & D.	.....	.....
Washington Pump Co.....5a.	75,000	.....	.....	.....	115	127
Quoted (Memor.)						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½¢@16¾¢; Lake, 17½¢@17¾¢; casting, 16½¢@16¾¢.

A new Woods Vehicle Company, capital \$1,500,000, has been incorporated under New Jersey laws.

As a result of Thursday's panic, eleven New York Consolidated Stock Exchange firms were compelled to suspend.

The stockholders of the Havana Electric Railway Company have voted to increase the common stock from \$10,000,000 to \$11,000,000.

The governing committee of the New York Stock Exchange has listed the General Electric Company's \$2,551,200 additional common stock.

United Railways of St. Louis preferred made a good net gain on Monday. It closed at 77½ bid, as compared with 70 bid at the close on Friday.

The Fulton and Oswego electric light and power plants of Oswego, N. Y., have been sold for \$65,000 to Street, Fykes & Co., brokers, of New York City.

The "Baltimore Manufacturers' Record" estimates that nearly 200 miles of trolley lines are planned to be built in the South in the near future or are actually under construction.

The employees of the United Traction Company of Albany, N. Y., have rejected a proposition of the company and of the National Board of the Amalgamated Union to arbitrate differences, and the strike is still on.

The work of burying the wires of the United States Electric Company, of Newark, N. J., which controls practically all the public lighting and power in that city, begins to-day with the laying of conduits in Broad street.

Copper during the past week was quiet, with producers still holding at the previous quotations. The export business shows some improvement over the previous month, although it shows a considerable falling off from last year's figures.

The Boston "News Bureau" states that it is the intention of the striking electricians to extend their strike to other cities in New England and to thus harass the New England Telephone and Telegraph Company until their demands are granted for a \$3-nine-hour day.

The United Traction Company of Albany, N. Y., reported for the five weeks ended May 2, that the total receipts from operation have been \$125,045.16, as compared with receipts for the corresponding period last year of \$120,704.85; showing a gain this year of \$4,340.31.

The following are quotations for some of the industrial stocks not quoted elsewhere: Electrical Lead Reduction, 4½¢@5¢; Electric Boat, 17¢@21¢; Electric Vehicle, 10¢@12¢; Tel. & Tel. Company of America (full paid) 6¢@6½¢; Electric Company of America, 9½¢@9¾¢; National Carbon, 15½¢@15¾¢.

The San Francisco Gas and Electric Company paid a dividend of 25 cents per share a few days ago. Four years ago the company began paying dividends of 50 cents per share monthly. Subsequently these were reduced to 42 cents, then 33 cents and now 25 cents. It is expected that the July dividend will be the last for some time.

The Union Traction Company of Philadelphia has made arrangements with Drexel & Co., to purchase for its account the bonds of the Lombard & South Streets Passenger Railway first mortgage 5 per cent. loan, due December 1, 1901, at 102½ per cent., with coupon due December 1, 1901, attached. Drexel & Co. will purchase the bonds on June 1, 1901.

The winding up of the affairs of the New England Electric Vehicle Transportation Company is in the hands of F. R. Hart and C. L. Edgar of Boston. It is understood that a cash dividend of \$2.25 will shortly be declared which represents cash now in the company's treasury. With the disposal of the real estate and vehicles it is estimated that the company can liquidate at \$4 per share or better.

At the annual meeting of the Chicago Edison Company, to be held on June 10 a proposition to increase the authorized capital stock of \$10,000,000 will be submitted to vote. The new stock is to be issued from time to time, when the directors shall decide what additions to the company's plants are necessary. The annual report of the company given out on Friday shows net earnings of \$902,958 for the fiscal year ending March 21, and a balance of \$145,407 to surplus after paying interest and dividends.

The directors of the New York Electric Vehicle Transportation Company have called an assessment of 10 per cent. on the stock, payable to W. K. Ryan, treasurer, at the Morton Trust Company, by June 6. Certificates should be presented for endorsement of the payment. In a circular, President Sanderson says that a considerable amount of the money must be apportioned to the betterment and enlargement of the Fifth Avenue Stage service. The earnings of the company have steadily increased, the April income being the greatest in the company's history. The demand for service has been constantly in excess of the equipment on hand. The company is experimenting with a new type of battery with double the present capacity. Additional stations must be provided before next winter.

It was learned on Monday in Philadelphia that negotiations between the American Railways Company and the Electric Company of America for a merger of the two corporations had progressed to a practical agreement upon terms, leaving only minor details to be arranged. The plan contemplates the organization of a new company which will issue bonds and stocks to take up the two companies. The basis on which the stock will be taken over if the deal is approved is 55 for American Railways and 11½ for Electric Company of America. The American Railways Company was chartered in New Jersey in 1900, and has an outstanding capital of \$3,757,000 in full-paid fifty-dollar shares. The Electric Company of America was chartered in 1899, and has an outstanding capital of \$20,237,050, of which \$7.50 a share or 15 per cent. is paid in.

ELECTRICITY.

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EDITORIAL NOTES.

The Meeting of the National Electric Light Association.

Elsewhere in this issue will be found the programme of the Twenty-fourth Meeting of the National Electric Light Association, which is now being held at Niagara Falls. The last Convention held by the Association at the Falls was on June 8, 9 and 10, 1897. Since then many changes have taken place there in the way of new power installations which cannot help but interest the members from a technical standpoint, even though they were present at the '97 Convention.

As may be seen by a glance at the programme, there are a number of interesting papers to be read on subjects of importance to the fraternity, which should elicit discussions that will tend to benefit the delegates in general. Among the reports those by the Committees on Standard Candle Power of Incandescent Lamps, and on Amendments to Freight Classification of Electrical Apparatus, would seem of great importance.

In previous years there has always been an elaborate entertainment programme, but on the occasion of this meeting no set arrangements have been made, as it was thought best to leave the delegates free to attend the Exposition in Buffalo and seek their own amusements, which, as a rule, electrical engineers on an outing have no difficulty in finding.

* * *

The Annual Meeting of the General Electric Company.

The annual meeting of the General Electric Company was held at Schenectady, N. Y., on Tuesday, May 14. Sixty per cent. of the total amount of the stock of the company was represented. There was very little business of importance transacted outside of the election of directors. The fact that Mr. Thomas Edison resigned from the directorate of the company, and that Mr. Frederick P. Fish was chosen to take his place caused no little comment, as it was thought by many that Mr. Edison had been forced out. Referring to the matter the N. Y. "Journal" said:

"Ever since the consolidation of the Thomson-Houston Company, and the Edison General Electric Company the tendency has been

to eliminate everything and everybody identified with the latter company.

"The culmination was reached on Tuesday, when Edison was thrust from the directorate. Plainly it is the wish of the capitalists behind the company and its officers to dissociate from it not only Edison's name, but his personality."

As every one is aware Mr. Edison is not strictly speaking a business man, and much prefers to spend his time in laboratory experiments than in attending directors' meetings and such being the case, the explanation which Mr. Edison is reported as having given, seems a plausible one. Mr. Edison asserts that he sent in his resignation two years ago, but it was not accepted nor acted upon. He resigned, so he says, because he never attended a meeting unless there was lack of a quorum, and then only in response to a telephone call. A month ago there was a pressing call for such attendance, and he responded at great personal inconvenience. He then urged that his resignation be accepted, and insisted on this course. The result was the dropping of his name. His relations with the management of the General Electric Company are now, as they have always been, entirely cordial, so it is claimed, and his retirement from the directorate is solely because he feels that he cannot afford the time necessary to attend to the duties of the position.

The fact that Mr. Fish, who has been elected a director in place of Mr. Edison, is the newly-elected president of the American Bell Telephone Company and the American Telephone & Telegraph Company has given rise to a rumor of a closer friendship in the future between the three companies, in which Mr. Fish is so deeply interested.

* * *

The Braking of Trolley Cars.

The accident which occurred to a trolley car at Leonia, N. J., on May 12, and which was referred to in a short paragraph in last week's **ELECTRICITY**, would seem to warrant the bringing up of the brake question again. As related last week, a trolley car, weighing no less than twelve tons and crowded to the utmost of its capacity with pleasure seekers, broke away in coming down a steep incline, with the result that on reaching a sharp curve at the foot of the hill, the body of the car was thrown on its side, injuring a score of persons more or less seriously. The accident was ac-

counted for by the motorman and others in the failure of the brakes to work properly. It might be in place to state here that the cars on this line are equipped with two independent sets of brakes, hand brakes and friction brakes.

It certainly seems strange that in the accident in question, both sets of brakes should have gotten out of order at the same time, as claimed. A representative of **ELECTRICITY**, who happened to be on the spot, made a cursory examination of the wheels and trucks a few minutes after the catastrophe, and in view of the fact that at that time the brake wheels were so hot that it was painful to touch them with the hand, would lead one to infer that one set of brakes got out of order, and by the time the other brakes could be applied the car had gained such a headway that they were inadequate to check the speed of the vehicle before it reached the curve.

Providing our surmise regarding the cause of the Leonia accident is correct, it certainly behooves the officials of that road to equip its cars with more powerful braking appliances. The New York State Railroad Commission about a year ago had tested in this city some twenty-five varieties of brakes, with the result that an electric brake stood first in order of merit, friction brakes next, a hand-power brake third and air brakes fourth. Such being the case, it would certainly seem as though nothing but the very best brake—apparently an electric one—should be adopted by a trolley road that operates its cars over hills that almost require for climbing a rack and cog.

* * *

The Carrying of Freight by Trolley Cars. Trolley freight cars are now beginning to spring up all over the country, in spite of the fact that a few years ago such a thing was unheard of. Probably the latest road to introduce trolley baggage cars is the Worcester & Southbridge Street Railway Company, which operates between Worcester and Southbridge in Massachusetts. In Michigan there is a trolley road, which conveys coal from one point to another, while in Northern Illinois a similar freight carrying trolley road is projected.

The Massachusetts road referred to above proposes to haul to the towns along the line supplies purchased from Worcester merchants, wholesale and retail, and from the towns to the city the milk and produce of the farmers and dairymen, and such factory products as are intended for Worcester and vicinity.

The company will have a terminal for express in the center of Southbridge and another at New Worcester. At the Southbridge terminal will be a telephone connected with the Worcester central office instead of the Southbridge exchange. This instrument will be free to patrons of the line who wish to order by express from Worcester merchants or others having business for the cars.

The Southbridge man, for instance, can call up a Worcester wholesaler and order a dozen barrels of flour delivered at the Worcester terminal of the company at New Worcester, and the next car will take the goods at the Southbridge terminal. It will be quick business and a great convenience to the suburban towns on the line, as well as a source of profit to the city of Worcester.

At the Worcester end the company plans to have a team to go the rounds and collect and

deliver packages to be sent or brought over the line. Those who have business connections with Southbridge or other towns will be informed that goods to be carried over the company's line will be called for when desired and delivered as fast as the cars can travel. As the trolley line parallels the New York, New Haven and Hartford railroad it is natural that the officials of the steam road should look on the proposed innovation with anything but favor. But as we stated in these columns some time ago, when referring to the carrying of freight by trolley cars, there would seem to be no valid reason why trolley roads should not carry freight, providing of course it does not interfere with the transportation of passengers. That railroad officials should feel more or less anxious and annoyed at this new departure is only natural, for in time it cannot help but effect the business of some of the railroads, especially in the line of farm products.

That the carrying of packages by trolley cars will also tend to hurt the express companies there is little doubt. But on the other hand the carrying of packages and light freight by trolley companies might prove of benefit to the general public, where a road runs from a thickly settled community out into the suburbs. With such a road the carrying of freight would unquestionably be of advantage to commuters, when the filling of a passenger coach with bundles of all sizes and shapes would probably be a thing of the past.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

A CABLE dispatch from London states that on May 17, the committee of the House of Lords passed the Mono Railway bill, which authorizes the construction of an electric express railway between Liverpool and Manchester.

ON May 17 the Statute Revision Commission of Connecticut sent to the General Assembly a new private corporations bill, which, if passed, will take from the General Assembly the incorporation of telephone, telegraph, electric light, street railway and other companies. It is a marked departure from the present law.

CONSIDERABLE use is made of electric switching locomotives in England, particularly in the yards of large manufacturing establishments. Such machines usually are built for a speed of only about four and a half miles an hour, but they are exceedingly powerful and are easily operated. Some of the best of these locomotives have been turned out by American firms.

THE strike of the street railway employees of Albany, Troy, Cohoes, Rensselaer and Watervliet, N. Y., is over. It caused the fatal shooting of two citizens, the wounding of twenty or more and the loss of thousands of dollars to the street railway company and its employees. Sunday, for the first time in twelve days, cars were run over the lines controlled by the United Traction Company and the troops were withdrawn from Albany. The end of the strike came on Saturday when it seemed most remote. The directors of the United Traction Company and committees representing the strikers had been conferring for nearly twenty hours, when by the surrender of two members of the

board of directors of the railway company the terms submitted by the strikers were accepted and signed. The surrender of the board of directors was understood to have been mainly due to the efforts of Anthony N. Brady and W. J. Walker, who are heavy stockholders in the United Traction Company.

A CORRESPONDENT of the London "Electrical Review," referring to the fact that the British Postal authorities recently placed an order in the United States for telephones, says: "It should be borne in mind that, although the telephone was invented in America, the first practical instrument was made and installed in England. British manufacturers promptly took up the matter, and in a few years the industry of manufacturing telephones was well established in this country. Unfortunately, however, the patents were acquired by a company, which at once proceeded to strangle the industry most effectually, and instead of manufacturing on a large scale, bought millions of pounds' worth of apparatus in America and on the Continent during the next 10 years, thus giving foreign manufacturers a splendid start over us, and causing a loss of at least 20 millions to this country."

ACCORDING to a report to the State Department at Washington from Consul Warner at Leipzig, the traffic of the electric railway lines of Saxony has increased considerably over that of last year, as the result of the opening of many new lines in the large cities. About the first of October, 1900, a new company opened up one of its lines to the public and the following figures show the extension in the facilities for the public: Total length of miles of railroad in 1899, 137.54; for 1900, 166.59; total number of persons carried during 1899, 113,592,390; for 1900, 147,645,690; total number of motor cars for 1899, 731; for 1900, 1,028; total number of trailers for 1899, 289; for 1900, 403. In conclusion the Consul says that other lines will be extended in Saxony during the present year, and as a consequence large supplies of steel rails and road equipments will have to be obtained.

LAST week the information was given out in insurance circles at Dallas, Tex., that fire insurance policies in many Texas cities and towns are to be cancelled on June 1 unless defects in electric wiring are remedied. An order has already gone out to cancel all policies held in Fort Worth and Gainesville. In March an inspector examined Fort Worth and his report was submitted to the Southeastern Association of Underwriters who passed it. The association concluded that Fort Worth was the worst wired city in the South and ordered every policy cancelled where owners refused to comply with the standard of the National Electrical Code.

ADMIRAL BRADFORD, chief of the naval bureau of equipment has given out the following extract from the report of the board which has investigated the question of transmitting messages by wireless telegraphy: "From the examination of the subject, as outlined in the orders of the department, the board makes the following recommendations: 1. That the use of homing pigeons be discontinued as soon as wireless telegraphy is introduced into the navy. 2. That pending such action, no new pigeon cotes be established. That wireless telegraphy be adopted by the

navy for transmission of messages between distant points. Referring to the last recommendation, the board is of the opinion that a high degree of special electrical training is demanded for the successful operation of any system of wireless telegraphy, and therefore suggests as necessary the establishment of two stations sufficiently far removed from each other for the training of officers and men. In its opinion this requirement would be best met by the establishment of such stations at the navy yard, Washington, and the Naval Academy, Annapolis. If wireless telegraphy fulfills what now seems to be its possibilities, the cadets should be thoroughly trained in it."

A PARTY of chief engineers and other experts connected with German street railways will arrive in this country the first week in June to study the American electric car systems. Though the German engineers will not be empowered to close any contracts for material, equipment, etc., with American manufacturers, they will gather data for submission to their respective executive officers, which it is anticipated will result in substantial orders being placed in the United States. This will be the first visit to America of electrical experts from Germany.

At a recent meeting in England of the Engineers and Shipbuilders' Institute a paper was read on liquid fuel, in which the different methods of burning oil was discussed. First, there is the system of mechanical spraying of oil by means of its own pressure—a system that requires a firebrick-lined furnace. It is said to require a large furnace capacity and a large excess of air, but the system is simple and noiseless, and 12½ lbs. of evaporation has been secured, which represents 64.6 per cent. efficiency with Borneo oil. The second system includes the admission of the oil as a gaseous spray by means of steam or air. A partial lining of firebrick is required in this system also, together with brick bridges and baffles.

A HUNGARIAN electrician, named Louis Zoltan, has invented an apparatus by which he claims he can send 80 telegrams simultaneously on the same wire, 40 in each direction.

The last cable car will be run on the Broadway line in New York next Saturday night, and the whole Metropolitan system will be then operated by electricity. It was thought that the cable would be cut last Saturday night, but owing to a delay in the perfection of the plans the work had to be postponed for a week. Every road of the Metropolitan Traction Company, except the Broadway, is now being operated by electricity. The Lexington avenue road changed from cable to electricity two weeks ago, and the Columbus avenue one week ago.

PROF. F. C. CALDWELL, who was retained some weeks ago to make electrolysis tests for the city of Columbus, O., to determine the danger of the water pipes being damaged by contact with currents of electricity escaping from the street car tracks, has filed his report with the board of public works. In it he states that the tests show a danger of electrolysis of the pipes and recommends that in the future the pipes be laid in the alleys and that the railway companies be compelled to improve the connections between the rails.

TWENTY-FOURTH CONVENTION OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

The annual Convention of the National Electric Light Association now being held at Niagara Falls, will probably be long remembered by those who are fortunate enough to be present. No better spot could have been selected for the meeting place, owing to the proximity of Buffalo, where at the Pan-American Exposition can be seen almost every type of electrical device which cannot help but interest the delegates. The power stations at

WEDNESDAY, MAY 22.

Morning Session, 10 o'clock.

Paper by H. W. Hillman, Schenectady, N. Y., "Arc Lighting at the Beginning of the Twentieth Century."

Report of Committee on Photometric Value of Arc Lamps, Henry L. Doherty, chairman.

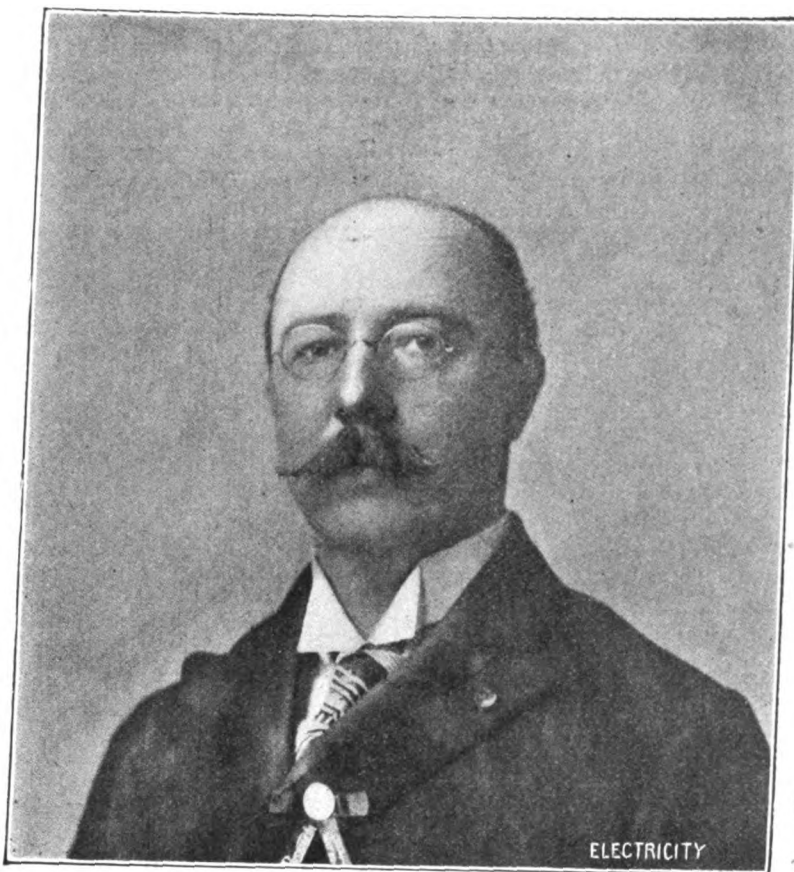
Afternoon Session, 2:30 o'clock.

Paper by Louis R. Wallis, Woburn, Mass. "The Foresee (4-C) System of Charging."

Report of Committee on Uniform Accounting, G. E. Tripp, chairman.

Report of Committee on Analysis of Flue Gases, Henry L. Doherty, chairman.

Executive session.



JAMES BLAKE CAHOON,
President of the National Electric Light Association.

the Falls will also be visited as well as several of the manufactories in which the electric current plays an important part.

As usual the social and entertainment features will be everything that can be desired, and that the meeting will prove most instructive to the professional men present may be gathered from the programme which is as follows:

TUESDAY, MAY 21.

Meeting of the Executive Committee at 9 A. M. at the Secretary's office, International Hotel.

Morning Session, 10 o'clock.

At Convention Hall, International Hotel:
Address by President Cahoon.

Paper by C. R. Van Trump, Wilmington, Del., "A Station Load Diagram."

Afternoon Session, 2 o'clock.

Paper by Francis W. Willcox, Harrison, N. J., "The Practical Side of the Incandescent Lamp."

Report of Committee on Standard Candle-Power of Incandescent Lamps, Dr. Louis Bell, chairman.

Report of Committee on Amendments to Freight Classification of Electrical Apparatus, James I. Ayer, chairman.

Report of Committee on Legislative Policy, Samuel Insull, chairman.

THURSDAY, MAY 23.

Morning Session, 10 o'clock.

Paper by Augustus Treadwell, Jr., New York City, "Storage Batteries in Central Station Work."

Report of Committee on Rules for Electrical Construction and Operation, Capt. William Brophy, chairman.

Topic: "Steam Heating from Central Stations."

Afternoon Session, 2:30 o'clock.

Paper by Calvin W. Rice, New York City, "Distribution of Current at High Potential in New York City."

Report of Committee on Amendments to By-Laws, Samuel Insull, chairman.

Executive session.

Reports of Secretary and Treasurer and Executive Committee.

Election of officers.

INSIGNIA.

Officers, red bow.

Executive Committee, blue bow.

Active Members, brown ribbon.

Associate Members, turquoise blue ribbon.

Reception, yellow ribbon.

Guests, rose ribbon.

Honorary members, white ribbon.

Press, olive green ribbon.

THE PAN-AMERICAN OPENING AND DEDICATION.

BY FRANK C. PERKINS.

The Pan-American Exposition was formally opened on May 1, but the dedication ceremonies took place on Monday, May 20. There were flights of pigeons, a display of Japanese daylight fireworks, the ascension of gas balloons and music on every side.

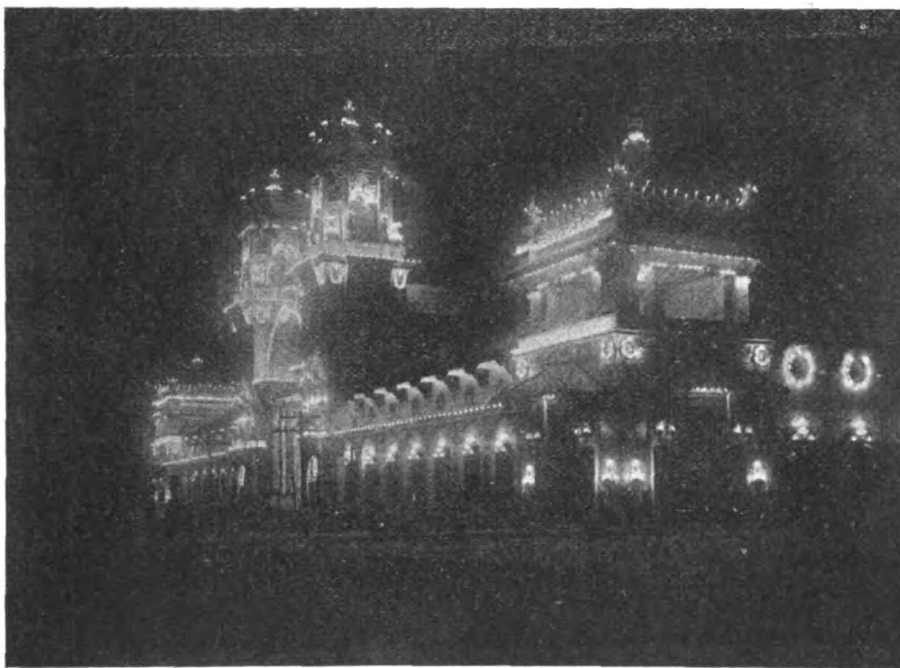
The invited guests assembled at the Temple of Music, where the Rt. Rev. C. H. Fowler, Bishop of the M. E. Church, made the opening prayer. Then followed addresses by Hon. Conrad Diehl, Mayor of Buffalo, by the Hon. Theodore Roosevelt, Hon. Henry Cabot Lodge, Hon. Timothy L. Woodruff and other well known men. Poems suitable to the occasion were also read. There were military and civil parades and altogether the ceremonies were most imposing.

The exhibits in the Electrical Building are nearly all in place and in running order.

ing. This company has sent to its exhibit a model of its shops in Schenectady, N. Y., Lynn, Mass., and Harrison, N. J., which are embellished with thousands of small electric lights, making a very pleasing and interesting exhibit.

The largest storage battery cell in the world it is said, is installed in the exhibit of the Gould Storage Battery Company of Depew, N. Y. The exhibits of the D. & W. Fuse Company, of Providence, R. I., are especially interesting, showing a full line of their inclosed fuses, junction boxes, entrance cut-outs, etc., for low and high tension service.

The American Lamp and Brass Company has a very fine display of handsomely decorated electric table lamps in Section "M" at the entrance nearest the Electric Tower. The telephone exchange is now complete, one of the finest switchboards of the common battery system of the Bell Telephone Company being shown in operation in its exhibit. The Stromberg-Carlson Telephone Company of Chicago



ELECTRICITY BUILDING, PAN-AMERICAN EXPOSITION.

The accompanying illustrations of the Electric Tower and the Temple of Music give but a slight idea of the beauties of the decorative effects on these magnificent structures. The switchboard and step-down transformers are now in place in the General Electric Exhibit and in perfect operation.

The large Stanley generator, weighing 45 tons and generating current at 12,000 volts potential with a capacity of 1,500 hp., is now in place and makes an interesting exhibit. The 75 ton 300 hp. Westinghouse gas engine is in place and above it in the Central Dome amid the varicolored bunting artistically draped are a large number of 200 candle power Nernst lamps, producing a lighting effect between the arc and the incandescent. In this electrical display above the engine the illuminating effect will aggregate about 20,000 candle power.

One of the most interesting exhibits to arrive was an old Edison Z Type Dynamo built in 1878, loaned as part of the Historical Exhibit of the General Electric Company of Schenectady. The booth of this firm is now completed. On the top is a roof garden, a unique feature, with chairs and palms. Here visiting engineers may sit and get a complete view of the entire build-

ing. This company has sent to its exhibit a model of its shops in Schenectady, N. Y., Lynn, Mass., and Harrison, N. J., which are embellished with thousands of small electric lights, making a very pleasing and interesting exhibit.

has installed a most expensive exhibit, having in addition to its regular exhibition sets about 60 'phones on the grounds used by the Exposition Company gratis. It required more than 300 miles of wire to complete the circuits. The other telephone exhibits are many of them in place, the Clark Automatic Telephone Switchboard Company of Providence, R. I., having been one of the earliest to complete its installation, showing desk sets, Clark dials with hand microphone, automatic switchboards for various number of points with front and backs removed, together with individual automatic telephone switches open for inspection to operate 75 telephones.

The National Carbon Company of Cleveland has a booth constructed entirely of carbon, the pillars being 9 inches in diameter and 5 feet high. They are the same as used in electric furnaces.

Mr. Charles T. Yerkes sailed on May 16 for England in connection with the underground traction in London. He plans to be gone only a month in the event of preliminary work progressing as he now expects.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 28.

ELECTROLYTIC DEPOSITION OF METALS.

Electroplating is a method of depositing metals from a solution of their metallic salts by electrochemical means. The industries dependent upon this branch of electrical application do not appear to be as widespread or as important as electric lighting, power, telephony or telegraphy, but, although electrochemical operation is not brought so vividly to the public notice, yet it covers a wide field of industries and to it we are indebted for many of the necessities and luxuries of life, while it also plays an important part in such



GEORGE FRANCIS SEVER,
Superintendent Exhibits, Electricity Building, Pan-American Exposition.

industries as electrotyping, bronzing, gilding, refining of metals and in the smelting of certain ores. Mostly all of the processes depend upon the laws of chemical action.

By electroplating is meant the process of covering articles of metal by a thin layer of another metal by means of electrolysis. The deposit is usually nickel, copper, silver or gold, and the metals most usually plated upon are brass, iron, steel, copper, german-silver, or white metal.

Plating vats for holding the solution and the articles being plated may be of any size, depending upon the amount of work to be done. They are usually made of wood and for nickel plating may be lined with lead, although this is not necessary. The usual arrangement for the current supply is to have two copper bars, on each side of the vat, one above the other and insulated from each other. One of these bars will be connected to the positive current and the other to the negative. Brass rods, to which are suspended the articles to be plated, are placed across the vat and resting on the negative bars. The metal being deposited is suspended from rods in contact with the positive bars. The whole is arranged so that the current will flow through the solution from the metal being deposited, known as the anode, to the articles being plated, known as

the cathode. The articles to be plated are ordinarily suspended by pieces of copper wire, excepting in silver or gold plating, when insulated wire is used to avoid an unnecessary deposit upon it. Of course the insulation is removed from the wire where it makes contact with the article being plated and the suspension rod.

As the quality of the deposit which is made in electroplating is of the greatest importance the following are the points to be looked after most carefully. The strength of the current, which is dependent upon the amount of surface to be plated, the density and temperature of the plating solution and the condition of the articles to be plated, when put into the solution. The current is most ordinarily furnished by small dynamos specially constructed for that purpose, which produce a low pressure with considerable ampere capacity. The pressure and current may be adjusted by means of an adjustable resistance box connected in circuit with the field coils of the dynamo. When

it. Brass, copper, iron or steel are the metals which are usually nickel plated, and the hardness of the nickel and the high durable polish makes a very satisfactory and lasting finish. The solution used is made from a combination of sulphate of nickel and sulphate of ammonia. This combination is ordinarily known as nickel salts. To make the solution, this salts should be dissolved in warm water in the proportion of about three-quarters of a pound of salts to a gallon of water.

To prepare articles for plating they must be very carefully polished and cleaned, after which they must be scoured by dipping in a hot lye solution and pickling in acid. The pickling in acid is very essential as the acid takes off the thin covering of oxide which quite often sticks to iron, copper or brass. If this oxide is not thoroughly removed the plating is liable to peel off when burnishing and polishing the articles. The deposit made on the cathode occurs as a result of electrolysis, while an equal amount of the metal will go into the solution

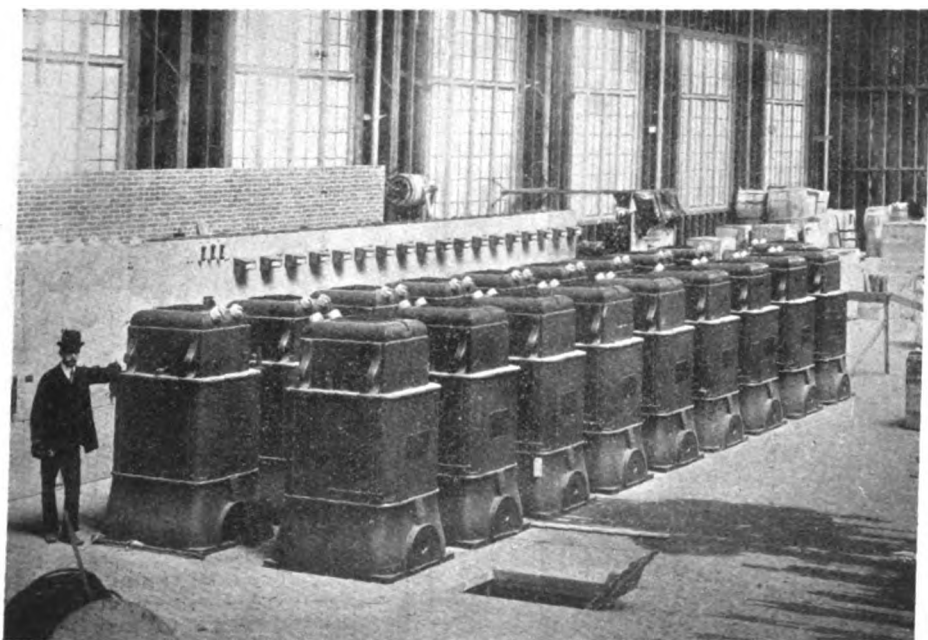
will become so intense that it will cause it to boil over and a great amount of heat will be generated. A solution of this kind should be kept in a dark place. There are a number of other salts of silver, such as chloride of silver, cyanide of silver, acetate of silver, sulphide of silver and oxide of silver, but none so commonly used in electroplating as nitrate of silver.

The process for silver plating is very much the same as in nickel plating. In preparing articles for silver plating the same precautions as regards cleanliness must be observed as in nickel plating.

GOLD PLATING.

The solution most commonly used is cyanide of gold and in principally all work is used when hot. Great care must be given to the details of gold plating to have all the conditions just right so that a satisfactory color may be secured. To accomplish good work much experience is necessary and it is difficult for amateurs to secure good results, besides it constitutes expensive experimenting.

The gilding of the inside of vessels, as often seen in silverware, is done by filling the vessel



TRANSFORMERS IN ELECTRICITY BUILDING, PAN-AMERICAN EXPOSITION.

the current is of the proper amount the covering which is deposited on the plated articles adheres closely and is hard and clear and will be deposited with reasonable rapidity. When the current supply is not sufficient the deposit may be of good quality, but the plating proceeds too slowly. When too much current is forced through, the deposit is liable to become dull or black and rough while gas is often given off at the cathode. Edges and points of articles being plated often gather a rough or granular deposit while the flat parts may be taking satisfactorily. Such difficulties can be overcome only by a proper adjustment of the distance between the anodes and cathodes. When articles which have great irregularities of surface are to be plated the distances between anodes and cathodes must be greater than when of a uniform surface, otherwise the more prominent points of the articles will receive heavy deposits while the hollows may receive little or none. It is important that as uniform a deposit as possible be placed on an article.

NICKEL PLATING.

Nickel plating is probably the most generally used and I will first describe the process of

from the anode, which is the plating metal. The amount of plating put upon an article of course may be controlled by the discretion of the person doing the work, as there is no rule governing just how heavy or how thin a plate may be.

After the plating is completed in the bath the articles, to have a finished appearance, must be put through a series of operations such as scratching, buffing and polishing which is done on rapidly revolving wheels covered with leather or canvas.

SILVER PLATING.

A salt of a metal is a chemical combination formed by the action of an acid on the metal and when we speak of salts of nickel or salts of silver we mean that it is a chemical combination of that metal formed by the action of acid upon it.

The solution which is used for silver plating is usually nitrate of silver produced by the action of nitric acid upon silver. To form this combine about four parts of the strongest nitric acid to one part of pure water and then add small pieces of silver at a time until the solution will dissolve no more silver. The silver must not be added too rapidly or the action



HENRY RUSTIN,
Superintendent Mechanical, Hydraulic and Electrical Engineering features at Pan-American Exposition.

with the solution and then placing it in contact with the negative current while the positive current is attached to a gold anode suspended in the center of it.

COPPER PLATING.

Copper plating is principally used in the process known as electrotyping, which is used so much in the printing industry. In electrotyping an impression of type, which is set up, or of cuts is taken on wax or paper pulp. The surface of the mould is then covered with powdered graphite to provide conductivity for the current, after which it is immersed in a bath of sulphate of copper as the cathode while a sheet of pure copper forms the anode. In the process of the electrolysis a thin coating of copper is deposited all over the surface of the mould which can be detached from the mould after it is taken from the bath.

The copper impression is then trimmed and backed up by a filling of type metal which is melted and run on the back and will then form a solid plate being in impression an exact duplicate of the type or cuts.

Copper plating is done to give a bronze finish to iron and is also used to make a foundation coating upon iron articles which it is desired to silver plate.

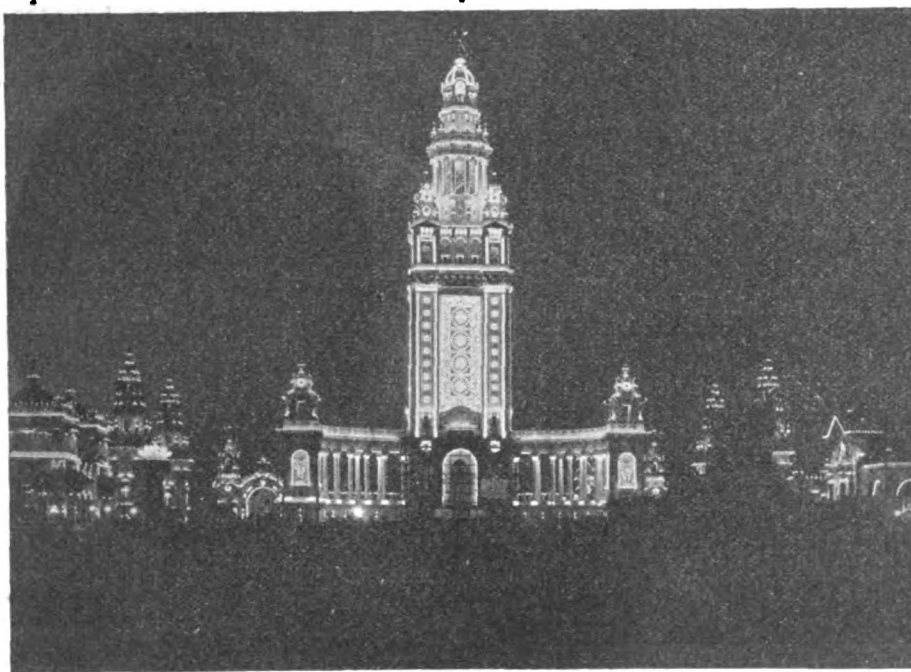
Article No. 29 will be entitled, "Condensers and the Measurement of Their Capacity."

THE HORSE POWER OF BOILERS.

BY W. H. WAKEMAN.

Some time ago I took up one of our excellent papers and found an article in it by a well known writer on the horse power of steam boilers. It will answer my purpose at this time to give his ideas in a general way, for such mistakes deserve at least a passing notice in order to prevent those who are not well informed on the subject from falling into error instead of absorbing correct information.

The ideas that I take exception to may be briefly stated as follows: There is no such thing as the horse power of a boiler, when considered independently of the engine. If a boiler is furnishing steam for a 75 horse power engine, it is a 75 horse power boiler. If it furnishes the required amount of steam without forcing it, then the boiler is as large as the maker intended it to be, but if it is necessary to force it continually, then it comes short of the maker's rating and should be condemned accordingly.



ELECTRIC TOWER ILLUMINATED (Incomplete) PAN-AMERICAN EXPOSITION.

I propose to show that such statements are unreliable and should fail to receive the slightest consideration. The following illustrations will make this clear as they are taken from my own practice and therefore are not theoretical conditions, but show the practical failure of attempting to rate a boiler by such a false standard.

A 75 horse power engine was supplied with steam by two boilers, each one of which was rated by the builders at 50 horse power. It was impossible to keep up steam and something had to be done in order to keep the plant in operation. According to the plan advocated by this correspondent, the engine was 75 horse power, therefore each boiler was 37.5 horse power and consequently was falling below the builder's rating by 25 per cent., which is a very large deficit. During the course of my investigations there I took some diagrams from the engine when a full load was on and found that it was developing 118 horse power.

Now this shows another mistake that is really not the intention of this article to expose, but as it is of interest to engineers, hence will receive attention.

An engine may be rated at 75 horse power, at fixed speed and with a certain mean effective pressure, but that does not prove that it will always develop 75 horse power, for while the speed may remain practically constant, the mean effective pressure will vary with the load, therefore the builder's rating of an engine shows that it is capable of developing under given conditions, but it really gives little or no clue as to what the machine is actually doing. As an extreme illustration of the truth of this statement I would say that I have taken diagrams from an engine which showed less than 4 horse power, but taking the idea of a fixed rate as advanced by some writers, in a literal sense it was still a 75 horse power engine.

When the engine above referred to was developing 118 horse power, the boilers were worked as hard as the available draft would admit, for the fires had to be sliced at short intervals, so that much good coal was sifted through the grates and lost in the ashes. Even the casual observer could tell that these boilers

were overloaded, for the given conditions, and yet steam was used for no other purpose except to run this so called 75 horse power engine. How absurd the idea of giving both boiler and engine the same rating is to any one who has given the subject a reasonable amount of intelligent study.

Another illustration of a slightly different character, but taken directly from practice, will show the fallacy of connecting the rating of boilers with the rating of engines.

A certain plant had two boilers that are rated at 100 horse power. They supply steam for an engine that is rated at 80 horse power. At times these two boilers are worked as hard as any boilers ought to be, yet are only furnishing 80 horse power, or 40 horse power each. There certainly is something wrong here, and when the indicator establishes the fact that the engine is developing only 45 horse power, it makes matters worse yet.

When I state that much live steam was used for purposes with which an engine has no connection, it will explain the trouble, but it does not make the idea that a boiler should always be rated according to the power developed by the

engine used in connection with it, any the less absurd or incorrect. I am justified in making this comparison of results because the idea of rating boilers on this erroneous basis is advanced without explanation or qualification.

I will go a step further and say that when these boilers are worked hardest, the engine is not running at all. How would said rule apply in such a case, taking it in its literal sense? It would decide that the boilers were not developing any power at all, and yet even the man who was shoveling the coal would not agree with this verdict.

If writers on this subject would devote their energy to explaining that the rating of a boiler has nothing whatever to do with the rating of the engine to which the steam is furnished, it would simplify matters, although it would at the same time deprive me of one subject on which to write an article, but I am perfectly willing that this should be done, for there seems to be no end of subjects on which to write articles for the mechanical press.

It has been said that we should not criticise another man's idea unless we have a better one to offer in place of it, and this is usually true.



THOS. M. MOORE,

Superintendent Exhibits, Machinery and Transportation Building, Pan-American Exposition.

In following out this plan I will state that when 30 pounds of water have been evaporated in one hour, under stated conditions, one horse power has been developed. This is the whole thing in a nutshell. The use to which this water is applied, after it has been evaporated into steam, has no bearing on the case whatever, and the two should not be mixed up together as they so frequently are.

I am certain that some reader will ask how he is to determine the size of boiler required for a given engine, and it gives me pleasure to reply as it is a very easy matter to decide.

Every engine should be sold under a guarantee as to the amount of steam it will take to run it for each horse power developed. Then multiply the horse power developed by the pounds of steam required to produce a horse power in this engine, and divide the result by 30. The quotient will be the horse power that the boiler must develop. If the actual conditions vary much from the standard conditions the former must be reduced to an equivalent of the latter, and the number so obtained is to be used as a divisor.

For illustration, suppose that a slide valve engine is to be installed to develop 90 horse power, taking 45 pounds of steam per horse power. How much power will the boiler de-

velop? $90 \times 45 \div 30 = 135$ horse power. The proper thing to do in such a case is to order a boiler that is guaranteed to develop 135 horse power, and when it is installed have a test made in order to find out whether it is capable of doing the work for which it was designed, or not. If it is impossible to keep up the required pressure of steam a test may determine that the engine is calling for perhaps 150 horse power at the boiler, so that it is doing 15 horse power more than it should be called upon for, and it would be very unjust to conclude that the trouble is due to insufficient boiler capacity.

If an automatic engine is installed that requires 30 pounds of steam per horse power, and 200 horse power is to be developed, then it will require two boilers each of 100 horse power to furnish the steam.

condensing engine will require but 19,980 per hour or 333 per minute.

These figures do not apply to the number of heat units that disappear in developing power, in any case, but to the number that must be generated by the boiler, and supplied to the engine.

NOTES ON METER TESTING.*

BY ARTHUR T. SMITH, A.M.I.E.E.

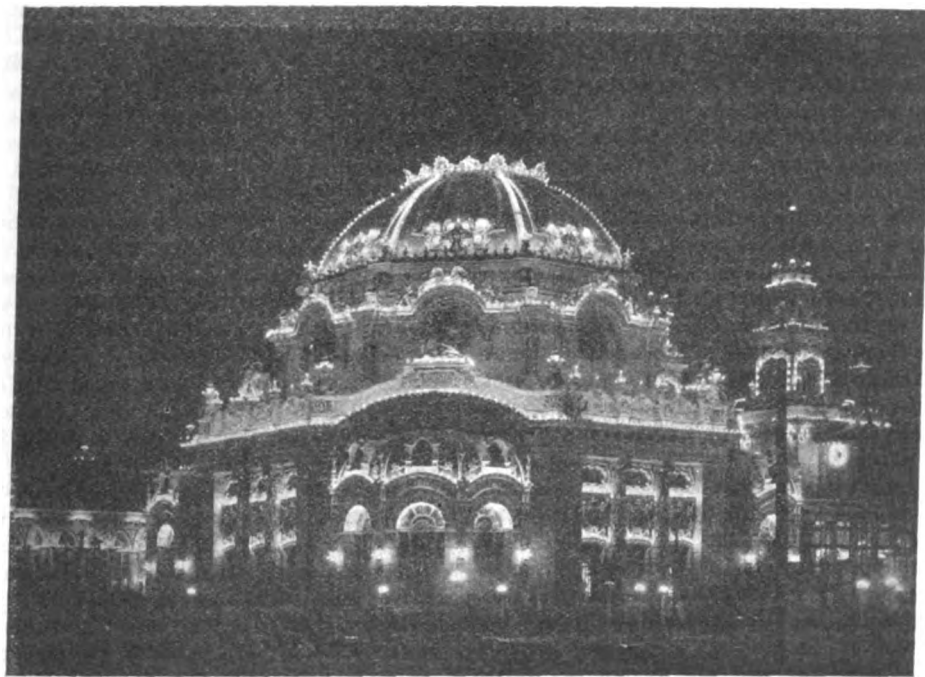
It is surprising what little attention is often paid to this most important branch of central station working, especially in the smaller stations. Meters are ordered, and delivered by the makers, and are put on one side until needed; possibly one is tried to see if it will start, and it is put in circuit with an 8 or 16 cp. lamp. If it starts well and good, the meter

of meters, and will take the Chamberlain & Hookham meter as an example, I will certainly give this firm credit for care in their testing, and for their fair dealing in the matter of complaints and inaccuracies. It is satisfactory to know that the difficulty which the makers of this meter at one time experienced with regard to the amalgamation of the armature is now entirely overcome, and I am anticipating no trouble with it in the future. It is sometimes necessary to renew the armature, owing to its being burnt up through a short circuit, or from some other accident damaging it in any way. A little care is necessary in removing the armature and replacing with another.

The mercury should be removed and the meter taken out of the case, then inverted, and the four screws removed from the plate holding the pivot and the iron bridge piece. (It is advisable always to unscrew the pivot first to prevent any accident to it.) If now the spindle be examined, two small file cuts will be noticed, one on the spindle and the other on the collar of the brake disk; this denotes the way which the little taper pin draws out, and this should be remembered in replacing the pin in another brake and spindle. When the pin is withdrawn the armature and spindle will draw out and leave the disk. On the meter being put together again and filled with mercury, it sometimes happens that an air bubble lodges under the armature, this must be removed or the meter will not start easily, but is easily gotten rid of by tilting the meter and revolving the disk. Before putting in a new armature care must be taken to scrape and thoroughly amalgamate the edge.

To test the meter for accuracy the handiest measuring instrument is a shunted ammeter and a set of shunts by the Weston Company, as with this instrument it is possible to measure currents from .01 ampere to 150 amperes, which gives a range sufficient for all ordinary purposes. It is the best plan to have the shunts mounted on a slate with a switch which throws each shunt in as required without breaking the circuit. The current must be capable of being varied, and this is most readily accomplished by sets of lamps and a resistance for fine adjustments. A booster may be used for higher currents than 10 to 15 amperes. The meters to be tested are all put in series, and I find it handy to put a slip of paper before each one with the number and capacity with any other items which may be needed, such as the testing currents, the constants obtained, etc., the results being finally entered in a book kept for the purpose.

The meters are first tested for starting, and the lowest current at which each starts is noted. With a 5 ampere meter the testing currents may be 1, 2.5 and 5 amperes, and start with .2 ampere or under. In each meter there is a small label on which is written the testing constant, which is "The figure that should be always obtained by multiplying the number of amperes passing through the meter by the number of seconds (or fraction of a second) occupied by one revolution." In practice it is advisable to take 10 times as many revolutions as the number of amperes passing through the meter. For example, testing with 1 ampere, count 10 revolutions, and the number of seconds on the stop-watch ought to agree with the value of the constant, that is, with the figures; the decimal point, of course, would be wrong, but that is not needed. With 2.5 amperes count 25 revolutions and so



TEMPLE OF MUSIC (ILLUMINATED), PAN-AMERICAN EXPOSITION.

Perhaps a compound condensing engine is to be used, that will develop 800 horse power, at 18 pounds of steam per horse power. This will call for 14,400 pounds of steam per hour, and 480 horse power of boilers will be sufficient to supply this steam.

The above statement of facts should show conclusively that the power developed by the engine, has nothing whatever to do with the boiler power required, except to supply a basis for calculating the latter. I have stated that 30 pounds of water evaporated per hour under given conditions constitute one horse power, but I did not explain what the conditions were, nor how to reduce the results obtained under other conditions to this standard, because a full explanation of these matters calls for an article on that subject alone, and at this time I wish to emphasize the idea that the two standards are not the same, and in reality have no connection with each other.

The boiler horse power calls for the use of 33,300 heat units per hour, or 555 per minute, and is always the same, while the number of heat units required for the engine horse power varies with the type of engine used to develop the power.

In the slide valve engine used in the first illustration, it calls for 49,950 heat units per hour or 832.5 per minute, while the compound

goes out; if it will not start, then it is often put on one side for a further consideration later on. To err is human; certainly electricity meter makers are sometimes very human, and it is advisable to test the accuracy of the little slip of paper which is often inserted in the meter and called the "Certificate of Test."

In many stations it would not pay to employ a man solely for meter testing, and it therefore devolves on one of the assistants. And it is this point which is often the cause of the neglect, as each assistant depends on the other, and neither, as a rule, knows what the other has already done. To obviate this, one assistant in a station should thoroughly understand the meters and testing, and not only know how to test a meter, but have a thorough theoretical knowledge of the principles of the meters used on that station. It is, of course, useless to expect a man to know every type of meter made, and hence even in the meter department uniformity of type is advisable; as few types of meter should be used as possible, not only for this reason, but because the spares and duplicate parts to be kept in stock are considerably reduced.

I give herewith a few hints as to the testing

*From the "Electrical Review," London.

on. By this means all calculations are avoided as the constant may be read directly off the watch. Below is an example of an actual test as entered up in the station test book:

No. of meter.	Size.	Current.	True constant.	Constant obtained.	Per cent. inacc'y.	Starting current.
21,732	5	1	4.67	4.64	.6 +	.2
..	..	2.5	"	4.68	.2 —	..
..	..	5	"	4.70	.6 —	..

REMARKS—Meter brought in dirt under brake disk.

If the meter is too fast on all loads it may be adjusted by slightly lowering the four brake poles above the Foucault brake disk, and by raising the poles away from the disk the speed may be increased. It may happen, however, that the meter has not the same percentage accuracy throughout the range, and may be slow at top load. This may be altered by giving the series coil more effect by inserting a small paper or thin fiber washer between the yoke which is in front of the meter, but if the reverse be the case and the meter is fast at top load, then the washer must be inserted between the back yoke. This weakens the action of the series coils and reduces the speed on top loads.

The 2½ ampere meter which this firm has brought out is a useful size, and especially as the price is lower it will bring down the cost of small consumers. These meters are sent out with the mercury separate, and it is absolutely important that they should be filled immediately on arrival or oxidization of the edge of the armature may take place and the accuracy of the meter be impaired.

The Bastian meter is a useful meter where the consumption with small currents is to be measured. To test this meter no current need be used, as all that is necessary is to calibrate the capacity of the tube containing the electrolyte.

Whatever the type of meter to be tested, accuracy and a methodical way of working are absolutely essential, and experience alone will reveal all the shortcuts. I have written these few and brief notes in the hope that they will be of use to some, and that they will also raise the interest taken in this often neglected department of electrical undertakings.

Experimenting With the Electrograph.

A photograph was successfully transmitted over a telegraph wire from the offices of the Associated Press in the Star Building at Washington, D. C., to New York City a few nights ago. The experiment was made to demonstrate the perfection of the electrograph, an instrument known as the Palmer and Mills invention. The two instruments used in the experiment are the only ones in existence, and they will be placed on exhibition at the Pan-American Exposition at Buffalo. It is confidently predicted by the inventors that the electrograph will soon be in practical use. To transmit a picture over a telegraph wire it is first photographed through a screen on a metal plate, similar to the process of making half-tones. The plate is then covered with wax, which is ground into all of the indentations in the plate and forms a non-conductor to the electric needle which passes over and transmits the raised metal lines to the receiving instrument at the other end of the wire.

LONG DISTANCE POWER TRANSMISSION FROM NIAGARA FALLS.*

BY H. W. BUCK.

There are three separate transmission circuits from the Niagara power house to Buffalo, two of which are copper, and installed on the same pole line. The third circuit is strung upon a separate pole line throughout its entire length and is of aluminum instead of copper. This aluminum line has the same resistance as each of the other two, and is composed of three cables of 500,000 circular mils each, made up of 37 strands. At the present market price of copper wire it is cheaper to use aluminum for overhead lines where the conductors do not have to be insulated. The conductivity of aluminum is less than copper, and the price per pound is greater, but the volume per pound of aluminum is much greater than that of copper on account of the lower specific gravity of the metal. When, therefore, resistance per pound is taken as the basis for comparison, aluminum is found to be cheaper.

Since the long-distance service to Buffalo was started in 1896, the line has been operated at a potential of 11,000 volts; but recently the voltage has been raised to 22,000, and the capacity of the three Buffalo circuits is now 30,000 hp., with about 10 per cent. line loss. No power is taken from the Buffalo transmission line until North Tonawanda is reached—a distance of about 10 miles. The Tonawanda Power Company, which is the name of the organization distributing power in this district, is a sub-company of the Niagara Falls Power Company, and at present utilizes about 1,000 horse power.

At the point where the Buffalo transmission line is tapped with supply lines for the Tonawanda sub-station the transmission line which supplies the city of Lockport with electric power is also connected. This branch line, consequently, has the same voltage, phase, and frequency as the Buffalo line. Its length is about 15 miles, making the Lockport sub-stations about 25 miles from Niagara Falls. Three hundred horse power is used by the local electric lighting company in motor generator sets, and about 600 hp. in a rotary converter sub-station which supplies power for local electric railroad service. It is from this sub-station that the 40-ton electric locomotives are operated which daily haul heavy freight trains on this feeder of the Erie Railroad, hauling at times as many as 28 loaded freight cars. Since the sub-station feeds direct current for a distance of 10 miles beyond the sub-station, on certain sections of this route the locomotives receive their power at a distance of 35 miles from the Niagara power house. This is a forcible illustration of what can be accomplished by the application of electrical power to steam railroad service.

About 23 miles from the Niagara power house, just inside the city line of Buffalo, the overhead circuit of the Buffalo transmission line enters the terminal house of the Cataract Power and Conduit Company. This company, which is also a sub-company of the Niagara Falls Power Company, distributes Niagara power throughout the city of Buffalo, purchasing it from the Niagara Falls Power Company at the Buffalo city line, at which point the responsibility of the latter company nominally ceases. In the terminal house the 22,000 volt current is transformed by six of the largest

*From "Cassier's Magazine."

transformers in the world, 3,000 hp. each, to three-phase, at a pressure of 10,000 volts, in which form it is distributed by underground cables to the various Buffalo sub-stations.

LONDON NOTES.

(From our London Correspondent.)

British Power Transmission Schemes.

During the past few weeks some important electrical schemes have been under the consideration of Parliamentary Committees in London. One of these is the Caledonian Electric Power Bill, which proposes to supply electrical energy from seven different generating stations for factory driving and lighting supply over an area of 1,135 square miles. Of the seven stations one would be placed near Yoker, one near Renfrew, one at Port Glasgow, one between Renton and Dumbarton, one near Uddingston, one near Kilmarnock, and one at Irvine. At the outset the combined capacity of these works will be 30,000 kw. and the capital cost is set down as about \$6,500,000. The area of supply contains large quantities of unexhausted coal and iron, and is a busy manufacturing district, where a supply of cheap electric power will confer enormous benefit. Lord Kelvin gave evidence in support of the proposal and said that the positions chosen for the seven generating stations were so arranged that the maximum distance which the power would have to be sent was 15 miles.

Another scheme of a similar nature is known as the Clyde Valley Bill, and it covers the greater part of the district included in the Caledonian proposal.

Yet another undertaking which is now being deliberated upon in committee is the Cleveland and Durham Electric Power Bill. It covers an area of 820 square miles south of the River Tees. The Cleveland district with its great iron-stone mines and ironworks is included. There will be six or seven generating stations of a joint capacity of 30,000 kw. and the capital is set down as \$6,500,000.

Storage Batteries in Power Stations.

Mr. J. S. Highfield, the engineer of the combined lighting and tramway system at St. Helens, has read an exhaustive and instructive contribution before the Institution of Electrical Engineers, entitled "Storage Batteries in Electric Power Stations, Controlled by Reversible Boosters." He stated that the use of batteries in direct current central stations has now become general, but there is a divergence of practice among engineers in the matter of the proportion that the battery bears to the steam plant. He gave a table showing the proportion of battery capacity to the steam plant capacity in many such stations in England. As there seemed to be no good reason for this great diversity of practice, Mr. Highfield placed before engineers what seemed to him to be the chief points in considering the designing of batteries for the work they are called on to do in central stations. He further described certain subsidiary apparatus which might be found of use and convenience in operating batteries. For his purpose Mr. Highfield divided stations into three sections, viz.: (1) lighting and general supply stations; (2) traction stations; (3) combined stations for supplying to the general town network and to a tramway system. The paper was illustrated by a large number of load curves.

Meeting of the American Society of Mechanical Engineers.

The American Society of Mechanical Engineers will hold its forty-third meeting at Milwaukee, Wis., on May 28 to 31. The programme of papers to be read is as follows:

"Requirements of Electricity in Manufacturing Plants," by W. S. Aldrich.

"Portable vs. Stationary Machine Tools," by John Riddell.

"Report of Committee on Standardization of Methods of Making Engine Tests."

"The Practical Application of Superheated Steam," by George A. Hutchinson.

"Superheated Steam," by E. H. Foster.

"Drafting Room and Shop Systems," by F. O. Ball.

"Blue Printing by Electric Light," by H. G. Reist.

"Rules for Drawing Office," by A. W. Robinson.

"Influence of Titanium on the Properties of Cast Iron and Steel," by A. J. Rossi.

"A Few Instruments of Precision at the Paris Exposition of 1900," by William E. Reed.

"Bevel-Gear Cutting Machines at Paris," by Fred J. Miller.

"The Locomotive Exhibits at the Paris Exposition of 1900," by Storm Bull.

"New Connecting Rod End," by C. W. Hunt.

"Method of Filing and Indexing Engineering Literature, Notes, Data, etc.," by George H. Marr.

"A Filtration Plant at Albany, N. Y.," and "Tests of a Hydraulic Air Compressor," by William O. Webber.

"The Bardwell Voltmeter," by Bardwell and Hamilton.

"Some Experiments on Ball Step-Bearings," by Chas. H. Benjamin.

"Pulley Press Valve," by F. H. Stillman.

"Determination of Fly-Wheels to keep the Angular Variation of an Engine Within a Fixed Limit," by J. I. Astrom.

"A Special Form of Boring and Facing Machine," by W. S. Russell.

"Efficiency Tests of 125-hp. Gas Engine," by C. H. Robertson.

"A Method of Preparing and Baling Cotton in Round Bales," by J. R. Fordyce.

"Protecting Ferric Structures," by M. P. Wood.

"An Improved Type of Ingot-Heating Furnace," by F. H. Daniels.

"The Entertainment of the Visiting Engineers in Europe in 1900," by H. H. Suplee.

The excursions will include trips through the plants of the Edward P. Allis Company, Nordberg Manufacturing Company, Filer & Stowell Manufacturing Company, Vilter Manufacturing Company, Christensen Engineering Company, Bucyrus Company and other shops in the vicinity; also to Waukesha and Mineral Springs.

Business Not Interrupted by Fire.

In the issue of *ELECTRICITY* of May 15 there appeared a four line item stating that the plant of the Standard Telephone & Electric Company of Madison, Wis., had been practically destroyed by fire. The company now writes regarding the matter as follows:

"We had on hand at the time of this fire practically \$100,000 worth of merchandise. Of this stock, we were damaged to the extent of \$10,000, fully insured. The building was not

insured, and was damaged to the extent of \$1,000. Our machinery was stopped less than two days, just long enough to admit of adjusting the loss with the insurance companies. A reconstruction of our present building of stone and brick will give us new and larger quarters. Our business in the meantime has not been interrupted, nor will it be."

CANADIAN NOTES.

(From our Ottawa Correspondent.)

Manager Walbank, of the Lachine Rapids Hydraulic & Land Company, Montreal, announces that it is the intention of his company to tender for the contract for lighting the streets of Montreal.

Although the bill to increase the stock of the Canadian Bell Telephone Company from five million dollars to ten millions, passed the Senate committee on Banking and Commerce without serious amendment, it was nevertheless, hotly contested in the Senate itself by those Senators who were determined that the company should be held down to the clause inserted in its charter in 1892 compelling the company not to raise its rates above what they were in that year. The demand is a most unusual one, but those who supported it claim that the company has received favors of the greatest value from Parliament, and that, in view of the handsome profit its business nets, it owes this much to the public. In consequence, however, of the determined opposition to the bill and the lateness of the Parliamentary session, Senator Kirchoffer asked leave to withdraw the bill for this year. He intimated that the company would endeavor to reach an understanding with the opponents of the measure during the Parliamentary recess.

How to Get to the Exposition After Reaching Buffalo.

The Buffalo Street Railroad officials express confidence in their facilities for handling the Pan-American crowds this summer.

New tracks have been laid on Elmwood avenue north of Forest avenue, and near the West Amherst Gate passenger depots have been erected and switches put in. The officials have been kept busy arranging routes and schedules. Extensive accommodations for handling large traffic are now ready at the East and West Amherst Gates.

A new line, running direct to the grounds, has been opened. This line, called the Jefferson, starts from the Erie and Central Stations and proceeds to the grounds via Jefferson and Main Streets, Florence, Parkside and Crescent avenues, unloading at the east gate. Other lines will be placed in operation as soon as the officials feel that this is justified by the traffic.

The Terminal Station, where the trains of the different steam railways discharge their passengers at the north of the Exposition grounds, permits of every facility for passengers who will be landed there. Eight tracks have been laid and there are five covered platforms, so that a number of different trains can be run into the station at the same time, and this will often occur, as several roads come into the station, and on big days during the summer when there are many excursions, the traffic at this point will be very heavy. It is but a few steps from this station through the Railway Exhibits Building and the great arches of the Propylaea to the beautiful Plaza whence the visitor entering from the north obtains his first general view of the Exposition.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended May 15:

Antwerp, 47 cases, \$6,875; Alicante, 18 cases, \$398; Argentine Republic, 16 cases, \$871; 5 packages, \$1,015; Athens, 60 packages, \$5,309; Australia, 211 packages, \$27,745; Barcelona, 26 packages, \$594; Berlin, 1 package, \$20; Brazil, 33 packages, \$1,896; British East Indies, 83 packages, \$2,755; British West Indies, 1 case, \$10; Cadiz, 14 packages, \$200; Central America, 212 packages, \$744; Chili, 16 packages, \$346; Cuba, 61 cases, \$437; Dublin, 4 cases, \$59; Dunkirk, 1 case, \$125; Dutch Guiana, 1 case, \$25; Dutch West Indies, 13 packages, \$260; French West Indies, 1 case, \$12; Gijon, 2 packages, \$117; Glasgow, 30 packages, \$8,764; 2 cases, \$60; Hamburg, 50 packages, \$4,316; Havre, 31 packages, \$1,012; Hayti, 2 cases, \$58; Helsingfors, 3 packages, \$773; Liverpool, 448 cases, \$21,595; London, 671 packages, \$77,024; 85 rolls electric cable, \$29,646; 21 motor cars and parts, \$4,950; Manchester, 11 packages, \$1,175; Marseilles, 8 cases, \$262; Mexico, 63 packages, \$1,082; Munich, 1 crate, \$500; Newcastle, 3 cases, \$500; New Foundland, 10 packages, \$251; New Zealand, 18 packages, \$1,204; Norwich, 1 case, \$300; Nova Scotia, 21 packages, \$273; Peru, 103 cases, \$9,241; 16 packages, \$1,522; Riga, 5 packages, \$1,779; Southampton, 1 case, \$20; U. S. Colombia, 17 packages, \$2,330; Venezuela, 35 packages, \$527.

PERSONAL MENTION.

Mr. F. Hild, formerly of Schenectady, N. Y., is now in Chicago, where as construction engineer for the General Electric Company he will superintend some work in connection with the construction of an electric road between Chicago and Joliet.

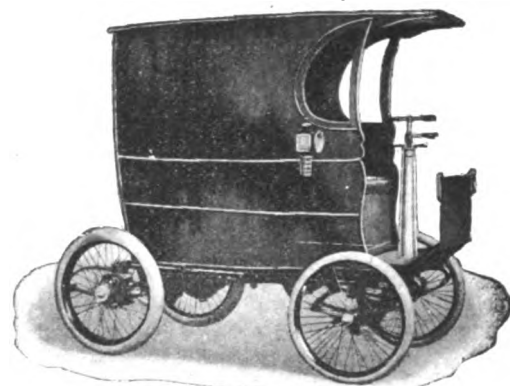
Mr. T. H. Mack, contract agent for the New York Telephone Company, has resigned his position on account of ill health.

COMMERCIAL PARAGRAPHS.

Longmans, Green, & Co., 91 Fifth avenue, New York, has recently issued a most interesting book by William J. Hopkins, entitled "Telephone Lines and Their Properties." This work, which is fully illustrated, contains some 300 pages of matter that should prove of great service to the telephone engineer. A list of books may be obtained by addressing the company as above.

"Motorettes."

The De Dion-Bouton "Motorette" Company, Brooklyn, N. Y., has recently installed a private nickel plating plant. This equipment comprises a number of novelties of interest to the trade. The dynamo is driven by a 3½ hp. water jacketed De Dion motor (belt connected). The gasoline tank is placed just above the motor, the vaporizer occupying its usual position to the left.

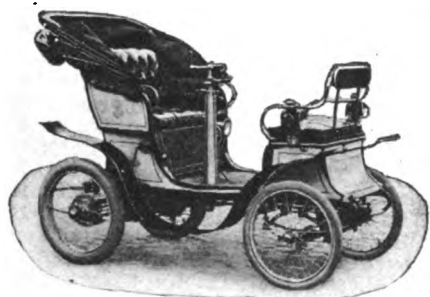


5 HP. DE DI ON MOTOR-DE IONER WAGON.

The exhaust is fitted to a standard 3/4 muffler placed outside, connected by a steel tube. The water jacket is connected to the regular water main via a 1/2" copper tube.

Two vats are already in place and doing service, but provision is being made for several others. Those now used are of different sizes, the larger vat being 6' long by 28" in width and 18" in depth. The smaller vat is 4' long by 18" wide and 16" deep.

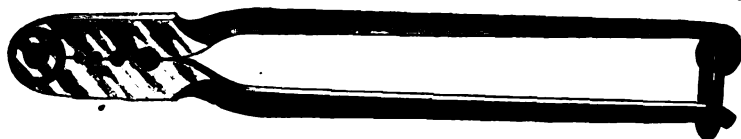
It is not generally known that the "Motorette" works are driven by a gas motor, but such is the case. This



No. 1 NEW YORK TYPE MOTORETTE.

engine is of 25 hp., and a similar one reached the works last week and will be installed at once. This plan of equipping the plant with gas engines follows a similar custom at the De Dion works in Puteaux, France, where 3,000 men are employed.

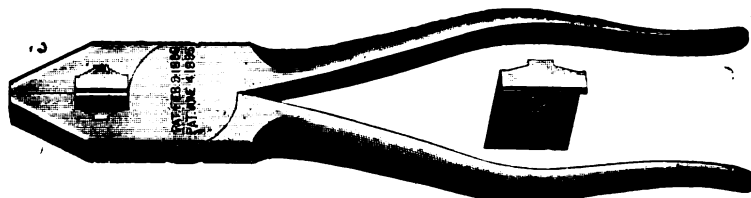
Probably no concern in this country carries a larger assortment of small and large springs of every description than the Wallace Barnes Company of Bristol,



Conn. Some of the types of springs manufactured by this concern are shown in the accompanying illustrations. The company makes a specialty of motor springs



and special shapes are furnished when desired. Persons interested may obtain catalogue "W," which is illu-



strated and contains a vast amount of useful information, free of charge, on request.

A Bit of History.

The Hartford Steam Boiler Inspection and Insurance Company, the pioneer boiler inspection and insurance company of this country, and the largest company of the kind in the world, was chartered in the spring of 1866.

Its object is the prevention of boiler explosions by thorough periodical inspections of the boilers, protection of life, limb, and property, and dissemination of scientific information upon all questions relative to construction and management of steam boilers and steam appliances generally.

The company aims to keep pace with the best engineering practice of the day, and have its recommendations embody that which has been tried and proven good.

Its capital (fully paid) is \$500,000, with assets, on

January 1, 1901, of \$2,701,027.06, having a surplus, as regards policy-holders of \$1,121,740.85, and it has returned to its patrons in losses paid, and inspections the sum of \$6,090,108.67.

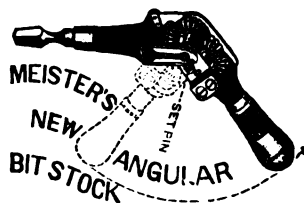
The Norton Electrical Instrument Company, Manchester, Conn., whose advertisement will be found elsewhere in this issue, reports that there is a constantly growing demand for its voltmeters and ammeters, so much so that the factory has to be kept running almost day and night. Electrical engineers interested in this line of goods may obtain an illustrated catalogue and price list free of charge by addressing the company as above.

Elsewhere in this issue will be found the advertisement of the Process Copper and Brass Company of Jersey City, N. J. As will be seen, this concern which makes copper castings by a new process, has supplied such castings to the leading electrical concerns of the country. The company makes trolley wheels, and cast trolley wheel bushings, wire couplers, rail bonds, commutator bars and other electrical devices.

We illustrate below a few of the specialties of the Smith & Hemenway Co., of No. 296 Broadway, New York City. The first illustration shows their No. 715

Swedish Lineup's Clamp. This is made from the celebrated Electro Boracic Steel, is beautifully finished and polished throughout. It is made with rounded corners, the advantage being that it can be carried in the pocket without tearing the clothes.

The next illustration shows one of the latest additions, the Meister Angular Boring Machines. This is a



very popular article and can run or bore at angles heretofore impossible. It is strongly made of fine appearance and runs perfectly true and is absolutely indispensable to telephone manufacturers, manufacturers of switchboards and electricians. Being able to bore at right angles it is possible to bore in deep and narrow places.

The third illustration shows the No. 90 Patented Royal Blue Side Cutting Plier. The advantage of

this tool is that the jaws are interchangeable and reversible, thus saving a large expense to the user. When the jaws become worn, they can be taken out and reversed by placing the lower jaw in place of the upper and the upper jaw in place of the lower.

Anyone interested in hardware would do well to write for the Green Book of Hardware Specialties issued by the above company.

INCORPORATIONS.

The Coal City Electric Railway Company, Marion, Ill.—to operate street railways and electric plants. Capital stock, \$100,000. Incorporators: P. M. Johnson, Frank P. Read and C. M. Atterbury.

The G. & E. Electrical & Construction Company, Binghamton, N. Y. Capital stock, \$12,000. Directors: W. H. Gaylord, Fred Eltapenc and E. Isherman, all of Binghamton.

The American Street Car Transportation Company, New York City—to deal in street car traction, railroad and ferry tickets. Capital stock, \$100,000. Directors: Andrew Bitt-

ner, New York City; T. W. Bolla, Jr., Glen Cove, and Katherine M. Storm.

The Hawey's Lake Miniature Electrical Railway & Light Company, Burlington, N. J. Capital stock, \$100,000. Incorporators: Edward Schwabenland, Riverside, N. J., and Howard Flanders, Burlington.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED MAY 14, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

674,109-674,109-674,110. Electric-Railway System. Benjamin W. Tucker, Newark, N. J. Filed Jan. 30, 1901, Feb. 9, 1901, Feb. 7, 1901.

674,340. Car-Fender. Archie W. Lindsey, Atlanta, Ga., assignor of one-half to Charles C. Chillingworth, same place. Filed Dec. 14, 1899.

ELECTRIC LIGHTS AND APPLIANCES.

673,935. Electric-Lighting System. Alexander J. Wurtz, Pittsburg, Pa., assignor to George Westinghouse, same place. Filed April 21, 1899.

673,951. Electric-Arc Lamp. John Herricht, Cleveland, O., assignor of one-half to Gustav Walther, same place. Filed Dec. 26, 1900.

674,067. Electric-Arc Lamp. William H. Northall, Elwood, Ind., assignor to the Lea Manufacturing Company, same place. Filed Jan. 18, 1900.

674,130. Electric-Arc Lamp. Tapley W. Young, Washington, D. C., assignor of one-half to Annie Campbell, same place. Filed Aug. 4, 1900.

674,151. Shade-Holder for Electric Lamps. Lewis J. Atwood, Waterbury, Conn., assignor to the Plume and Atwood Manufacturing Company, same place. Filed Oct. 31, 1898.

674,283. Electric-Lamp Socket. John D. Pierce, Philadelphia, Pa. Filed May 21, 1900.

674,338. Electric-Arc Lamp. John Herricht, Cleveland, O. Filed Aug. 27, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

673,910. Controller for Motors. Christian W. Kragh, Madison, Wis., assignor to the Northern Electrical Manufacturing Company, same place. Filed April 14, 1900.

673,911. Polyphase Alternating-Current Motor. Benjamin G. Lamme, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company of Pennsylvania. Filed Jan. 30, 1899.

673,980. Electromagnet-Motor. Louis H. Englehardt, Everett, Mass., assignor of one-half to Harry M. McNelly, same place, and Mark Gallert, Waterville, Me. Filed June 22, 1900.

674,080. Electric Igniter for Explosive Engines. William G. Stoltz, Brooklyn, N. Y. Filed Feb. 5, 1901.

674,076. Electric Switch. Cummings C. Chesney and Herbert W. Smith, Pittsfield, Mass., assignors to Stanley Electric Manufacturing Company, same place. Filed July 23, 1900.

674,207. Electric Switch. Joseph C. de Janisch, Paris, France. Filed April 27, 1900.

MISCELLANEOUS.

673,900. Electric Battery. David H. Darling, Jr., New York City, assignor to the United States Battery Company, same place. Filed Oct. 11, 1899.

673,908. Electric Cable. John D. Gould, Brooklyn, N. Y. Filed April 6, 1898.

673,912-673,913. System of Electrical Distribution. Benjamin G. Lamme, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company of Pennsylvania. Filed July 14, 1900.

673,952-673,953. Asymmetrical Electrical Conductor. Leo W. Hildburgh, New York City. Filed Nov. 22, 1897, April 24, 1899.

674,018. Electrical Contact Device. Miner Robinson, Newton, Mass. Filed Jan. 31, 1901.

674,020. Igniter or Circuit-Breaker. William G. Stolz, Brooklyn, N. Y. Filed Feb. 5, 1901.

674,106. Battery-Cell. Edward Tiquet, Romford, Eng. Filed Jan. 9, 1901.

674,124. Electric Heater. Conway Robinson, Baltimore, Md. Filed April 17, 1899.

674,289. Electric Clock-Winding Mechanism. Victor Odquist, Chicago, Ill., assignor to Albert Tuerk, same place. Filed June 25, 1900.

674,333. Coin-Controlled Electromedical Battery. Jacob G. Hartman, Baltimore, Md. Filed Jan. 24, 1900. Renewed Oct. 17, 1900.

DESIGNS.

34,502. Case for Electrical Measuring Instruments. Frank W. Roller, New York City. Filed March 30, 1901. Term of patent 7 years.

34,503. Insulating-Block for Electric Lamps. Irving E. Brown, Providence, R. I., assignor to Providence Gas Burner Company, same place. Filed April 5, 1901. Term of patent 14 years.

THE TELEPHONE WORLD.

Model Telephone Exchange at the Pan-American.

The Model Telephone Exchange is now in working order in the Electricity Building. It is so placed that all the mystery of the business is exposed. Visitors can see the apparatus from all sides. There are 72 'phones on the switchboard, and they reach every part of the ground, being supplied free to the police, fire and other departments of the Fair. Several have been put in the press headquarters, and are available at all hours for the free use of the newspaper men. The system was installed by Engineer Paul M. Krahmer, who went to Buffalo a month ago and drove the first stake. The system in use is that for which a franchise is being sought by a Buffalo company to compete with the Bell Company. The machinery is made by the Stromberg-Carlson Telephone Company of Chicago. The 'phones are automatic, and there are lights to signal a call and to disconnect.

For some months there has been a bitter fight on in Boise City, Idaho, between the Rocky Mountain Bell Telephone Company and the Independent Telephone Company. The former is the old established concern of that section, with long-distance lines in every direction; the latter is a new corporation, composed of local capitalists, and the fight becomes more interesting every day. The Bell people lately notified the public that it was making straight two year contracts for 'phones, and that upon signing one of these the subscriber was presented with a receipt in full for the first year's charges. The Independent people have made no counter move in this line as yet. An alternative writ of mandamus has been issued against the Oregon Short Line Company, returnable at once if it does not allow the installation at its depots of Independent 'phones, the latter company having tried time and again to make such installation 'phones to be put in and maintained free of charge, but the railway has invariably refused. The manager for the local company claims that the railway people are influenced by the Bell. The Independent people say they will fight to the bitter end, and they seem to have a great many people with them. The great drawback to their system is lack of long-distance lines.

The annual stockholders' meeting of the Rockingham, Va., Mutual Telephone system, was held recently. David D. Showalter was reelected president, and John A. Wenger, secretary and treasurer. The annual fee for switchboard service was increased from \$2 to \$3. More than 1,100 'phones now enter the switchboard in Harrisonburg, Va. Outside of town the 'phone-holders own the lines and instruments and the system is on a purely mutual basis. The \$3 fee is the only fixed charge for service. In the town of Harrisonburg subscribers pay \$8 and \$15 respectively for residence and business 'phones. Rockingham is said to have a complete and cheap rural telephone service.

The Secretary of State recently chartered the Lattimore Telephone Company of Lattimore, N. C., with a capital stock of \$1,350. The stockholders are S. S. Royster and D. D. McBrayer of Moonsboro, and J. H. Jones of Lattimore. The company has all the privileges and powers usually conveyed to corporations of the kind.

The New York Telephone Company has bought from Banker James Loeb, of Kuhn, Loeb & Co., the eight-story business building, with plot, 50 x 100, Nos. 53 and 55 Franklin street, in this city. The structure is known as the Eagle Building, and is occupied in part by the Telephone Company as its Franklin street exchange.

The Belmont Telephone Company will commence shortly to put up its poles in Martin's Ferry, O. The only delay is the non-arrival of a sufficient number of poles to keep the men at work. It expects to have the 'phones in operation by July 1, as the contracts call for.

The citizens of Bettsville, O., have concluded that they have been behind the times long enough, and are making arrangements to have a telephone exchange installed in their village. F. E. Vorheis, of Gibsonburg, O., is behind the project and will have charge of the work. It will be an independent exchange.

Representatives of the Berks County Telephone Company met a short time ago at the office of Charles C. Kurtz and dissolved the corporation. The company had intended to operate in Reading, Pa., but failed to secure the desired franchise.

The Century Telephone Constructing Company, which recently secured a franchise in Elmira, N. Y., is endeavoring to secure a franchise in Ithaca, of this State.

Telephone Evolution Promised in Chicago

According to the New York "Commercial," Chicago may look for more than an evolution in the methods of its telephone business when Mr. Sabin has full charge, and perhaps "revolution" would better express the radical changes he will make in the systems, the prices, the management, etc. He proposes to eliminate the obsolete methods in use in Illinois and Iowa, and to substitute the newest appliances. Mr. Sabin recently said:

"As superintendent of the Iowa, Chicago and Central Union Telephone Companies I will have general supervision over all the telephone systems in Illinois, Indiana, Iowa and Ohio, with the exception of the systems in Cleveland and Cincinnati. There are five times as many telephones in the California system as in Iowa, Illinois, Indiana and Ohio. Here we have under 3,000,000 people and there 18,000,000.

"In San Francisco we have 25,000 telephones, 10,000 of which have been put in in the past two years. This has been done by popularizing the 'phone through the nickel in the slot attachment. Any one who can afford gas in his house in San Francisco can afford a 'phone. It is the graduated cost that has made us grow. Now the area in the East to be covered by the three companies is but one-third as much as the coast, and the people there are more compactly settled."

"With these conditions prevailing there is an immense field for development and progress. The interests of the several telephone companies over which I have control are not consolidated, but are as separate as before my appointment as president of the directors."

On May 15 the police of Trenton, N. J., discovered that of the several thousand pounds of copper telephone wire stolen, which has effectually shut off talk between that city and Philadelphia, 2,000 pounds of wire was cut from the Bell Company's circuit near Burlington. The "wire gang" has been at work throughout New Jersey and the thieving has tied up more than one branch of the suburban trolley and telephone lines recently. The men usually cut the wire close to the poles, and dressed as linemen. Frequently work in broad daylight without the slightest interference. Communication by telephone between Trenton and Philadelphia has been impossible for some time, because of the wire thieves' activity, except by the roundabout way over the Doylestown circuit. Rewards are offered by the trolley and telephone companies for the capture of the wire thieves, and if caught in New Jersey a full measure of justice is promised.

Representatives of the People's Telephone Company have been in Victor, N. Y., securing the right of way through that town for the erection of poles and the stretching of wires. This company's line is in successful operation in the southern part of Western New York and is proving a formidable rival to the old established line because of its lower rates and better service. A branch line will also be built from Victor to East Bloomfield over the Boughton Hill road. This is proving a great accommodation to residents of rural districts, connecting their homes with those of their friends, and with the surrounding country, giving them about as good service as if they lived in the city. The company expects to commence the erection of the line immediately.

At a recent meeting of Murdock, Minn., business men and farmers living north of that town, the Murdock-Carlson Telephone Company was organized by the election of the following officers: President, C. H. Fredrickson; vice president, L. H. Lawson; secretary A. L. Bergstrom; treasurer, John Brandt. The object of the organization is the construction of a telephone line from Murdock to Carlson, a distance of ten miles north.

The Northwestern Telephone Company asks for permission to put up poles and wires for a new telephone in Brainerd, Minn. It agrees not to exceed \$2 per month for office 'phones and \$1 a month for residences. The present price paid the local telephone company is \$3 and \$1.50 respectively. The matter will come up for action at the next regular meeting of the council.

The People's Telephone Company, which was recently granted a franchise to operate a telephone exchange in Lynn, Mass., has filed its bond for \$10,000, with the city clerk. This bond is to insure the carrying out of the agreement with the city according to the provisions of the franchise granted. The engineering department of the company will shortly commence work on the plans for construction work.

The Burton, O., Telephone Company has increased its capital stock from \$5,000 to \$15,000.

Proposals for Furnishing Underground Telephone and Telegraph Cables.

Sealed proposals will be received at the office of the Commission, Washington, D. C., until 12 o'clock M. Saturday, June 1, 1901, for furnishing underground signal and telephone cables for the fire alarm and police telegraph and telephone service in the District of Columbia. Separate bids will be considered for the several items enumerated. Specifications and blank forms of proposals may be obtained at that office. H. B. F. Macfarland, John W. Ross, Lansing H. Beach, Commissioners, D. C.

The United States Telephone Company will build simultaneously with the Everett-Moore Detroit & Jackson work a toll line from Detroit to Pontiac, Mich., and from Holly, which is already connected with Pontiac to Corunna, with a branch line from Fenton to Flint. These lines will afford a straight connection between Saginaw, Bay City and Saginaw Valley, and nearly straight connections between Detroit and Grand Rapids.

An independent telephone company is being organized at Redkey, Ind. The stockholders, business men of the town, have subscribed \$2,500 in \$25 shares. The purpose is to connect with independent exchanges in other towns, and help fight the Central Union.

Three telephone companies are competing for business in Spencer, Ind. Each of the local companies has about 100 subscribers, and there are 600 telephones in Owen County connected with them.

The Dayton & Troy, O., Electric Railway Company has changed its charter so as to enable it to conduct a telephone and electric lighting business and to make traffic arrangement with other roads.

Tallapoosa, Ga., is now connected with the outside world by telephone, as the Gainesboro, Tenn., Telephone Company of the Georgia division has finished putting up its wires.

Work on the new telephone line from Maine Prairie to Kimball, Minn., has commenced. Dr. Shercourt, it is understood, is backing the enterprise.

TELEPHONE INCORPORATIONS.

The Farmers' Telephone Company, Janesville, Wis. Capital stock, \$2,100.

The People's Telephone Company, Chillicothe, Ill. Capital stock, \$1,000. Incorporators: B. F. Zinzer, Howard L. Pettet and W. D. Kelly.

The People's Telephone Exchange, Yates City, Ill. Capital stock, \$2,000. Incorporators: W. G. Lehman, O. B. West and L. D. Fletcher.

The Independent County Telephone Company, Polo, Ill. Capital stock, \$30,000. Incorporators: B. W. McHenry, W. P. Graham and A. B. Sheadle.

The Galt Telephone Company, Galt, Mo. Capital stock, \$2,400. Incorporators: Robert Willis, J. T. Hudson, G. M. Bennett and others.

The Sharpsburg Home Telephone Company, Sharpsburg, Ky. Capital stock, \$3,500. Incorporators: B. T. Wright and R. A. Atkinson.

The Hancock County Telephone Company, Hawesville Ky. Capital stock, \$3,000. Incorporators: I. C. Adair, Louisa Adair and W. E. Ford.

The Ellis County Telephone Company, Waxahachie, Tex. —to run telephones between the towns of Ray, Howard, Maloney, Nash and Avaton. Capital stock, \$2,000.

The Jackson County Telephone Company, Newport, Ark. Capital stock, \$2,000. Officers: John W. Ferrell, president; R. K. Fitzhugh, vice-president; B. B. Bond, secretary and treasurer.

The Minnesota Rural Telephone Company, Princeton, Minn. Capital stock: \$50,000. Incorporators: Louis Rust, Edward L. Saxton, Clarence T. Johnson, all of Princeton, and Louis Erickson and Andrew E. Westling of Wyanette.

The Commercial Telephone Company, San Antonio, Tex. —to maintain a telephone system in the counties of Orange, Jefferson, Liberty, Harris, Galveston, Fort Bend, Austin, Wharton, Colorado, Fayette, Caldwell, Guadalupe, Gonzales, Bexar, Lavaca, Washington, Burleson, Milam, Robertson Falls, Limestone, Navarro, Ellis and Dallas. Capital stock, \$500,000. Incorporators: Z. B. Campbell, H. M. Aubrey of San Antonio, J. E. Boynton, Waco; C. M. Haskell, Ottawa.

GENERAL ELECTRICAL NEWS.

Lighting.

Albany, Ga.—An election will soon be held to vote on the question of issuing \$25,000 in bonds to build an electric light plant here.

Bessemer, Ala.—It has been decided to issue \$40,000 in bonds for the erection of an electric light and power plant at this place.

Coeymans, N. Y.—Alden Nodine has been surveying the town with a view to establishing an electric light plant in the near future.

Delray, Mich.—Dr. F. J. Clippert and Superintendent C. E. Lyon of the Michigan Carbon Works will ask the Delray council at its next meeting for a gas and electric lighting franchise.

Denton, Md.—The Hughes Lumber & Coal Company contemplates building an electric light plant.

Dyersburg, Tenn.—On June 1 the mayor and aldermen will receive bids on granting a 20 year franchise on a water and electric light plant to be put in the city. W. A. Fowlkes, mayor.

Kenton, O.—The People's Heat & Light Company of this city was lately incorporated with \$100,000 capital stock. This company will erect an electric light plant to compete with the Kenton Gas & Electric Company.

Lancaster, S. C.—A Northern company has made a proposition for erecting an electric light plant here.

Lebanon, N. J.—It is proposed to bond the town for \$15,000 for the purpose of establishing an electric light plant.

Longview, Tex.—The electric light plant in this city was destroyed by a recent fire, causing a loss of \$2,500.

Madison, Wis.—A bill providing for a State electric lighting plant for the Capitol Building was recently passed by the Senate. The bill authorizes the Governor to contract for the construction of such a plant and appropriates \$35,000 for the purpose.

Mattoon, Ill.—Extensive additions are to be made to the Mattoon Heat, Light & Power Company's plant; also new machinery is to be installed. About \$25,000 will be expended in improvements.

Milan, Tenn.—The public electric light plant here is to be improved.

Oshkosh, Wis.—The Oshkosh Electric Light & Power Company will rebuild its entire plant at a cost of about \$50,000, as soon as the city lighting contract is awarded.

Parsons, W. Va.—The Parsons Electric Light & Power Company has been incorporated by H. K. Grubb, W. G. Conley and others. An electric light plant will be erected for which H. K. Grubb has received a franchise. Address W. G. Conley secretary.

Pipe Stone, Minn.—The Pipestone Electric Light, Heat & Power Company a short time ago filed articles of incorporation with the Secretary of State. It has a capital stock of \$50,000. The officers are D. J. Nerney, president; J. F. Conklin, vice-president; F. P. Wilson, secretary and treasurer, all of Minneapolis.

Ravenswood, W. Va.—This city is preparing to erect an electric light plant.

Richmond, Ind.—J. M. Westcott, will lend this city \$100,000 for an electric light plant.

Santa Paula, Cal.—The citizens are agitating the question of erecting an electric lighting system.

Shepherdstown, W. Va.—This city has voted to issue \$4,000 in bonds to erect an electric light plant.

Terre Haute, Ind.—Geo. McL. Johnson, senior member of the L. B. Root Company, contemplates the erection of an independent private electric light plant.

Trevorton, Pa.—The citizens have almost subscribed \$7,000 for stock in the electric light plant to be established here.

Utica, Ill.—This place will have an electric light plant, which will be operated by a 75 hp. engine.

Van Etten, N. Y.—The citizens of this place are agitating the erection of an electric light plant in this village.

Washington, D. C.—The Indian Bureau has about completed plans for the new heating and electric lighting plants for the Fort Totten, N. D., Indian school, for which \$18,000 was appropriated by Congress.

Street Railways.

Brazil, Ind.—Messrs. W. R. Risher, C. McGaughey and G. W. Robinson have petitioned the county commissioners for a right of way over the gravel roads north to Caseyville for the construction of an electric street car line.

Denver, Col.—The proposition to erect a tramway system to bring down the ores of Gilpin and Clear Creek Counties to this city and intermediate points for treatment meets with decided approval among the miners interested, as it is conceded that it will be of great benefit; insuring more prompt delivery, cheaper transportation and quicker returns to the miners. An electrical engineer will soon undertake the work of investigating the ore situation in order to ascertain what amount of business can be relied upon for the system.

Fairport, N. Y.—The Fairport Electric Railway Company was incorporated last week with a capital of \$110,000 to construct an electric road 11 miles long between and in this place and Rochester.

French Lick, Ind.—Dr. George S. Gagnon of New York expects to build two large hotels at French Lick and West Baden, and an electric railroad connecting two towns which are one mile apart. He will also build a running course. The enterprises contemplate an investment of \$1,500,000. The doctor has secured 230 acres between the two towns, and will build an electric railroad on his own land.

Galesburg, Ill.—The People's Traction Company of this city has been incorporated with \$10,000 capital stock by F. W. Latimer, L. W. Sanborn and others.

Hamilton, O.—Dr. S. T. George of Dayton, president of the new Ft. Wayne, Dayton & Cincinnati Electric Traction Company, has lately been in Hamilton procuring options on property for a right of way between this city and Cincinnati. The road is to be 320 miles long. D. W. Lafetra of New York is at the head of the syndicate furnishing the capital for the enterprise. The company is incorporated under the laws of South Dakota with \$4,500,000 capital stock.

Hempstead, N. Y.—The Mineola, Hempstead & Freeport Traction Company has obtained from the trustees a franchise to build a trolley road through the village to connect with the proposed line to Queens. The company will commence the work of construction before August 1.

Hopedale, Mass.—At a recent meeting here of President John T. Manson of the Milford, Holliston & South Framingham Street Railway Company, and the directors of the Grafton & Upton Railroad Company, plans were perfected so that the steam road will be equipped and run by electricity.

Janesville, Wis.—The Janesville city council has granted an electric railway franchise to the Janesville-Rockford line.

Kalamazoo, Mich.—The Kalamazoo & Lake Michigan Electric Railway Company has increased its capital stock from \$60,000 to \$200,000.

Port Clinton, O.—The latest rumor in the way of electric railroad news is that of a project on foot to construct a line from Toledo to this place as near the shore of the lake as possible.

Utica, N. Y.—The Cleveland syndicate, which recently purchased the street railroad properties in this city, has bought the Herkimer, Mohawk, Ilion & Frankfort Street Railroad. The Utica road will be extended to Frankfort and to Rome, rails being now on hand for that purpose. The link just purchased is seven miles long and fully equipped. It is an important move in the scheme to parallel the Central Hudson from Albany to Buffalo with a double track electric line.

Wilkes-Barre, Pa.—The Wilkes-Barre & Hazleton Railroad Company, composed of the leading spirits of the Lehigh Traction Company, owning electric lines in Hazleton and vicinity, purposes building a traction line between Hazleton and this city. It is to be about 25 miles long.

Zanesville, O.—The county commissioners have granted an electric railway franchise to G. K. Browning, representing Eastern capitalists, from this city to Hebron along the National road.

Manufacturing.

Atlantic City, N. J.—The Ernest W. Naylor Engineering Company, capitalized at \$100,000, has been formed here to manufacture electrically controlled engine valves.

Boston, Mass.—George O. Proctor, Guy H. Proctor and Charles H. Pease are the promoters of the New England Electric Manufacturing Company, capitalized at \$30,000.

Cleveland, O.—The United Electric & Manufacturing Company of this city, with a capital of \$10,000, was lately incorporated by Thomas Sheehan, C. J. Estep, Ira Culver, M. F. Parrett and W. L. West.

Greenville, Miss.—The Delta Electric Light, Power & Manufacturing Company, capitalized at \$50,000, was chartered here a short time ago. Henry Crittenden, Arthur Hider, C. Jaeger, W. E. Hunt, F. Geardina, Angelo Corroero and Alfred Shields are the interested parties.

Philadelphia, Pa.—The American Electrical Manufacturing Company of this city, with a capital of \$300,000, has been organized.—Sparks from a neighboring chimney set fire to the building of the Scott & Janney Electric & Manufacturing Company last week, causing a loss of \$1,000.

Company Matters.

Albert Lea, Minn.—The stockholders of the Albert Lea Electric Company have voted to increase the capital stock from \$100,000 to \$200,000.

Chicago.—The Marshall Electric Company has changed its name to the J. S. Richards Manufacturing Company, also the location of its principal office from Marshall to this city.

Reading, Pa.—I. J. Lerch has purchased from J. K. Righter the stock and good will of the Reading Electrical Construction Company, and will form a company, to be known as the Pennsylvania Electric Company. It will be an auxiliary to the People's Company and will establish a general electric and construction business.

Power and Transmission.

Boise City, Idaho.—Fast upon the success of the Trade Dollar Company in its great water power scheme on Snake River come a number of similar projects, all tending to utilize the hitherto unused waters of the State. The latest and one of the many feasible is that by Judson Spofford and associates to create some 2,000 horse power from the waters of the Payette River, with which to furnish electric power and light to the mines at the Pearl camp and power for this city.

East Liverpool, O.—Within the next four months upwards of \$5,000 will be spent for improvements to the plant of the United Power Company, located here.

Automobiles.

Carlisle, Pa.—A company in which E. J. Pennington of Philadelphia is interested, is being organized here to manufacture automobiles.

Haverstraw, N. Y.—The Haverstraw Auto-Service Company will operate a stage route in Rockland County through the towns of Haverstraw, Stony Point and Clarkstown with a capital of \$10,000. George P. Hilton and Hershel Roberts of Albany, and Charles M. Hilton of Haverstraw, are interested in the concern.

Newport, R. I.—E. C. Hayward, manager of the Newport branch of the New England Electric Vehicle Transportation Company, has opened the Newport branch for the season. It is reported that the company will not rent electric machines this summer, but will sell and care for them.

Youngstown, O.—The Church Automobile & Specialty Company, a corporation composed almost exclusively of Pittsburgh people, desires to locate in this locality and has in mind Youngstown as the most desirable point. The company is incorporated at \$125,000.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by **ELECTRICITY** from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crl. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Author'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y. —May 18						
United Traction.....	100	\$5,000,000	\$5,000,000	1% % Q.	108	108
(Consolidation of the Albany and Troy City Railway.)						
Allentown Pa. —May 18						
Allentown & Lehigh Val. Trac Co		4,000,000	1,500,000	.....	—	15
Bridgeport, Conn. —May 18:						
Bridgeport Traction Co.....	100	2,000,000	2,000,000	1 % Aug.	100	—
Baltimore Md. —May 18						
United Railways & Elec. Co.....com	50	24,000,000	18,000,000	.....	17 1/2	17 1/2
Boston, Mass. —May 18						
New England Street Ry.....	25	5,000,000	1,081,925	1 % Q., Jan. 15,	—	—
North Shore Traction Co.....com	100	4,000,000	4,000,000	.....	15	16
North Shore Traction Co.....pfd.	100	3,000,000	2,000,000	6 % S. A. & O.	85	87
West End Street Ry. Co.....com	50	10,000,000	4,000,000	8 % % S., Oct.	114	116
West End Street Ry. Co.....3 % pfd.	50	4,000,000	6,400,000	4 % S., Jan.	114	116
Boston Elevated R. R.....	100	10,000,000	.....	2 1/2 % Aug. 99.	79	181
Brooklyn N. Y. —May 18:						
Brooklyn City Ry.....	100	2,000,000	1,928,400	.....	241	242
Brooklyn Rap. Transit Co., tr. cert.	100	43,000,000	48,000,000	.....	77	77 1/2
Brooklyn Heights Railroad.....	100	200,000	200,000	.....	107	109
Brooklyn City RR.....guar.	100	12,000,000	12,000,000	3 % % Q., Jan.	27	28 1/2
Brooklyn, Queens Co. & Sub. RR.	100	2,000,000	2,000,000	.....	—	—
Coney Island & Brooklyn RR.....	100	2,000,000	1,844,200	2 1/2 % Nov., '99	325	330
Kings County Elevated.....	100	4,750,000	4,750,000	.....	—	—
Kings County Traction Co.....	100	4,500,000	4,500,000	1 % July	—	—
Nassau Electric Railroad.....pfd.	100	6,000,000	6,000,000	.....	82	88
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000	.....	—	—
Brooklyn, B. & W. E. Railroad.....	100	1,000,000	1,000,000	.....	—	—
Buffalo N. Y. —May 18						
Buffalo & Niagara Falls Elec. Ry.....	100	1,250,000	1,250,000	.....	74	75
Buffalo Railway Co.....	100	6,000,000	5,870,500	1 % Q. Dec., 99.	99	100
Columbus O. —May 18						
Columbus Street Railroad.....	100	8,000,000	8,000,000	1 % Q., Feb.	88	88 1/2
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000	.....	94	98
Charleston, S. C. —May 18						
Charleston City Ry. Co.....	50	100,000	100,000	3 % S.	—	—
Enterprise City RR. Co.....	25	1,000,000	250,000	.....	—	—
Chicago, Ill. —May 18						
Chicago City Ry. Co.....	100	12,000,000	12,000,000	3 % Q., Dec. 31,	250	260
Chicago & South Side R. T. RR.....	100	10,828,800	10,828,800	.....	18 1/2	19
Lake Street Elevated RR.....	100	10,000,000	10,000,000	.....	31 1/2	33 1/2
Metropolitan West Side Elev. Ry.....	100	15,000,000	7,000,000	Feb 28 1900.	90	93
Met. West Side El., pfd.....	100	15,000,000	9,000,000	.....	209	210
North Chicago Street RR.....	100	10,000,000	6,000,000	3 % Q., Jan.	197	203
North Chicago City RR.....	100	5,000,000	249,900	.....	108	109
South Chicago City Railway.....	100	2,000,000	1,608,200	.....	103	104
West Chicago St. RR. Co.....	100	20,000,000	18,189,000	1 1/2 % Q., Feb.	14	14 1/2
Union Traction Ry.....com	100	1,250,000	624,900	35 %	58	58 1/2
Union Traction Co.....pref.	100	2,000,000	2,000,000	5 % S.	—	—
Cincinnati, Ohio. —May 18						
Cincinnati Inc. Plane Ry.....com	50	1,000,000	875,000	.....	—	—
Cincinnati Inc. Plane Ry.....pfd.	50	150,000	150,000	.....	75	76
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	3 1/2 % Feb.	124 1/2	125
Cincinnati Street Ry. Co.....	50	18,000,000	14,000,000	1 1/2 % Q., Jan.	128 1/2	129
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	.....	—	—
Cleveland, Ohio. —May 18						
Akron, Bld. & Elev. Elec. Ry.....	100	1,000,000	1,000,000	1 % Jan.	48	50
Cleveland City Ry.....	100	8,000,000	7,600,000	1 1/2 % Jan.	102	102 1/2
Cleveland Electric Ry.....	100	12,000,000	12,000,000	1 % % Q., Oct.	88	88 1/2
Detroit, Mich. —May 18						
Detroit Citizens' Street Ry.....	100	2,000,000	1,250,000	.....	100 1/2	—
Fl. Wayne & Belle Isle Ry.....	100	1,200,000	1,200,000	.....	175	—
Rapid Railway Co.....	100	250,000	250,000	.....	90	100
Detroit Electric Railway.....	100	1,000,000	1,000,000	.....	—	—
Wyandotte & Detroit River Ry.....	100	250,000	200,000	.....	120	110
Dayton O. —May 18						
City Railway Co.....com	100	1,500,000	1,470,500	1 % % Q.	140	145
City Railway Co.....pfd.	100	600,000	600,000	1 % % Q.	170	—
People's Street Railway.....	100	1,100,000	1,100,000	.....	114	115

PASSENGER RAILWAYS.

NAME.	Par	Author'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn. —May 18						
Hartford Street Ry. Co.....	100	\$4,000,000	\$300,000	3 % S., Oct.	190	—
Hartford & West Hartford &.....	100	1,000,000	267,500	.....	—	—
Holyoke Mass. —May 18						
Holyoke Street Ry. Co.....	100	400,000	400,000	3 % A., June,	207 1/2	212
Hoboken N. J. —May 18						
North Hudson Co. (N. J.) Ry. Co....	25	1,250,000	1,000,000	3 %	180	—
Indianapolis, Ind. —May 18						
Indianapolis Street Ry.....	—	5,000,000	5,000,000	.....	25	25 1/2
Lancaster, Pa. —May 18						
Pennsylvania Traction Co.....	100	10,800,000	9,900,000	.....	—	—
Lancaster & Col. Electric Ry.....	—	—	87,500	.....	—	—
West End Street Railway.....	—	—	—	.....	—	—
Louisville, Ky. —May 18						
Louisville Ry.....com	100	4,000,000	3,500,000	1 % % April,	82	88
Louisville Ry.....pfd	100	2,500,000	2,500,000	1 1/2 % S., Oct. 1,	112	118
Minneapolis, Minn. —May 18						
Twin City Rapid Transit.....com	100	17,000,000	15,010,000	.....	68 1/2	68 1/2
Twin City Rapid Transit.....pfd	—	8,000,000	1,712,200	1 1/2 % Oct.	186	187
Montreal, Canada. —May 18						
Montreal Street Ry. Co.....	50	4,000,000	4,000,000	3 % S. M. & N.	279	280
Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1 1/2 % S. J. & J.	11 1/2	11 1/2
Memphis Tenn. —May 18						
Memphis Street Railway Co.....	100	500,000	500,000	.....	25	—
New Haven, Conn. —May 18:						
Fair Haven & Westville RR.....	25	2,000,000	2,000,000	1 % S., Sept.	80	41
New Haven Street Railway Co.....	100	1,250,000	1,000,000	1 1/2 % A., July	—	—
New Haven & Centerville.....	100	700,000	800,000	.....	—	—
Winchester Avenue RR.....	25	1,000,000	800,000	.....	45	46
New Orleans, La. —May 18						
Canal & Claiborne RR. Co.....	40	240,000	240,000	1 % S., July	—	—
New Orleans & Carrollton RR.....	100	1,200,000	1,200,000	1 1/2 % Q., Oct.	118 1/2	120
New Orleans Traction Co new com.	100	—	—	.....	22 1/2	24
New Orleans Traction Co new pfd.	100	—	—	.....	95	96
Crescent City RR.....guar.	100	2,000,000	2,000,000	3 % S., Jan.	20 1/2	20
New Or. City & Lake RR.....guar.	100	2,000,000	2,000,000	1 % S., Jan.	—	—
Orleans Railroad.....	50	500,000	185,000	1 1/2 % % June,	—	83
St. Charles Street Railway.....	50	1,000,000	1,000,000	1 % % Oct.	58 1/2	59
New York —May 18						
Central Croton RR.....	100	800,000	800,000	2 1/2 % Q.	255	260
Christopher & 10th Sts. RR. guar.	100	550,000	550,000	2 % % Q., Oct.	175	185
Dry Dock, E. Bldg'g & Battery RR.	100	1,200,000	1,200,000	1 1/2 % % Q., Nov.	120	118
Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000	2 % % Q., Feb., 1900.	168	16 1/2
Bleecker St. & Fulton F. Ry. guar.	100	900,000	900,000	1 % % A., July.	45	51
Brooklyn & Seventh Ave. guar.	100	2,100,000	2,100,000	2 1/2 % Q.	26	240
Gen. Park, N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2 1/2 % Q.	208	210
Eleventh Avenue RR.....	100	1,000,000	1,000,000	.....	393	406
42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	1 1/2 % Q.	392	402
Ninth Avenue RR.....guar.	100	800,000	800,000	.....	198	201
Sixty Avenue RR.....guar.	100	2,000,000	2,000,000	.....	30	35
Twenty-third St. R. R. Co. guar.	100	600,000	600,000	1 1/2 % Q.	100	110
Second Avenue RR.....	100	2,500,000	1,862,000	2 % Q., Jan.	2 1/2	212
Third Avenue RR.....	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.	124 1/2	125
42d St. Manhatville & St. Nich. Av	100	2,500,000	2,500,000	.....	60	75
Union (Hudson) Ry.....	100	2,000,000	2,000,000	.....	190	200
Newark N. J. —May 18						
Consolidated Traction Co. of N. J....	100	15,000,000	15,000,000	.....	67 1/2	68
North Jersey Railway Co.....	100	6,000,000	6,000,000	.....	20 1/2	21 1/2
United Elec. Co. of New Jersey....	100	804,000	804,000	1 1/2 % A.	26	216
Pittsburg, Pa. —May 18						
Allegheny Traction Co.....	50	500,000	500,000	.....	27	28
Consolidated Traction Co.....com	50	15,000,000	15,000,000	2 % Jan.	26 1/2	26 1/2
Consolidated Traction Co.....pfd.	50	4,778,850	—	1 % Nov.	6 1/2	6
Central Traction Co.....	50	1,500,000	—	1 % Nov.	78 1/2	71 1/2
Citizens Traction Co.....	50	8,000,000	—	1 % A.	123 1/2	—
Duquesne Traction Co.....	50	8,000,000	—	1 % A.	—	—
Pittsburg Traction Co.....	50	2,500,000	—	1 % Nov.	—	—
Federal St. & Pleasant Valley Ry....	25	1,400,000	—	1 % % July,	27	28
Allegheny & Man. Trac. Co.....	50	8,000,000	—	1 % Aug.	—	—
Pittsburg & Birmingham Trac. Ry....	25	1,600,000	—	1 % Oct.	41	43 1/2
Pittsburg & West End Ry.....com	50	8,000,000	—	1 % June	—	—
United Traction Co.....com	50	17,000,000	—	J. & J.	8 1/2	18 1/2
United Traction Co.....pref	50	8,000,000	—	J. & J.	5 1/2	8 1/2

* Unlisted. † Ex div.
 a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.
 b Leased to Boston Elevated Railroad Company.
 c Owned by Brooklyn Rapid Transit Company.
 d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
 e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
 f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
 g Owned by Atlantic Ave. RR. and leased to Nassau system.
 h \$30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; \$250 100 of stock owned by North Chicago Street Railroad Company.
 i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
 j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,100 of stock owned by West Chicago Street Railroad Company.
 k Majority of stock owned by Chicago West Division Railway Company; 5 % on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
 l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex div.
 a Leased to New Orleans Traction Company at 6 % on stock.
 b Leased to New Orleans Traction Company at 8 % on stock.
 c Leased to Central Croton Railroad at 8 % on stock and interest on bonds.
 d Operating the former Met. Trac. system, that corporation having become extinct.
 e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
 f Leased to Houton, West Street & Pavonia Ferry—now Metropolitan Street Railway.
 g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
 h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1893, at \$215,000 per annum.
 i Leased to Metropolitan Street Railway for 18 % on stock.
 j Leased to Met. St. Ry. for 90 years from April 21, 1892; 6 % first 5 years, 8 % thereafter.
 k Leased to Metropolitan Street Railway for \$145,000 per annum.
 l Leased to Metropolitan Street Railway for 18 % on capital stock.
 m Controlled by Third Avenue Railroad by purchase.
 n Dividends of 1 1/2 % yearly guaranteed by Consolidated Traction Company.
 o Controls by lease the Allegheny, Cent. Citizens Duquesne, Fort Pitt & Pitt's Traction.
 p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
 q Leased to Fort Pitt Traction Company for 6 % on \$3,000,000 capital stock.
 r Leased to Consolidated Traction Company for 4 % on capital stock.
 s Leased to Consolidated Traction Company for 7 % on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS

NAME.	Par.	Authorized.	Issued.	Rate and Date of Last Div.	Per.	Assets.	NAME.	Par.	Authorized.	Issued.	Rate and Date of Last Div.	Per.	Assets.
New Bedford Mass.—May 18							Boston, Mass.—May 18						
Union Street Railway Co.....	100	\$250,000	\$250,000	2 % Feb.	100	165	American Tel. & Tel. Co.....	100	50,000,000	22,650,000	4 % Q. Jan.	173 1/2	174
Northampton, Mass.—May 18							Erle Telegraph & Telephone Co.....	100	10,000,000	10,000,000	1 % Q. Feb. 20,	87	174
Northampton St. Ry.....	10	800,000	226,000	4 % A. June.	170	178	New England Telephone Co.....	100	10,894,600	10,804,800	\$1.50 p. sh. Feb.	189	140
Omaha, Neb.—May 18							New York.—May 18						
Omaha Street Ry.....	10	5,000,000	5,000,000	8 % A. and N.	55	65	American Telegraph & Cable Co.....	100	14,000,000	14,000,000	1 % Q. Q.	91	94
Paterson, N. J.—May 18							Central & South Am. Tel. Co.....	100	5,500,000	5,500,000	1 % Q. Q.	100	106
Paterson Ry. Co.....	100	1,250,000	1,250,000		54	—	Commercial Cable Co.....	100	10,000,000	10,000,000	1 % Q. Q.	118	175
Providence, R. I.—May 18							Franklin Tel. Co.....	100	1,000,000	1,000,000	1 % Q. Q.	62	53
United Traction & Electric Co.....	100	8,000,000	8,000,000	3/4 % Oct.	110	111	Erle Telegraph & Telephone Co.....	100	5,000,000	4,800,000	1 % Q. Feb.	116	118
Philadelphia.—May 1							Gold & Stock Tel. Co. guar. 6 %	100	5,000,000	5,000,000	1 % Q. Q.	116	118
Fairmount Park Trans. Co.....	50	2,000,000	1,770,000	2 % Dec.	28	24	International Ocean Tel. Co. guar. 6 %	100	8,000,000	8,000,000	1 % Q. Q.	8	8
Hestonville, Man. & Fairmount.....	50	1,966,100	1,966,100	2 1/2 % July 15,	47	48	Mexican Telephone Co.....	100	2,000,000	2,000,000	1 % Q. Q.	163	68
Hestonville, Man. & Fairmount.....	50	538,900	538,900	8 % July,	75	76	New York & New Jersey Tel. Co.	100	5,000,000	5,728,000	2 1/2 % Q. Jan.,	70	70
Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	8 % Feb. 1,	27 1/2	28	Pacific & Atlantic Tel. Co. guar. 4 %	25	2,000,000	2,000,000	1 % Q. Q.	96	00
Union Traction Co.....	50	80,000,000	29,980,450		81	31 1/2	Postal Telegraph Cable Co.....	100	15,000,000	15,000,000	1 % Q. Q.	115	115
Electric Traction Co.....	50	8,297,920	8,297,920		45	—	Southern & Atlantic Tel. Co. guar. 5 %	25	950,000	559,522	1 % Q. Q.	98	00
Frankford & Southwark Pass. Ry.	50	500,000	192,500	8 share Q.	45	—	Commercial Union Telegraph Co.	25	500,000	500,000	1 % Q. Jan.,	98 1/2	3 1/2
Lehigh Avenue Ry. Co.....	50	1,000,000	1,875,000	\$14 share A—Apr. 1,	48	48 1/2	Western Union Telegraph Co.	100	97,870,000	97,870,000	1 % Q. Jan.	98 1/2	3 1/2
Lombard & South Street Ry.	25	1,000,000	1,000,000	A. & O.	30	90 1/2	Miscellaneous.—May 18:						
Second & Third Streets Ry.	50	1,000,000	771,078	\$9 share A, Mar. 9,	100	—	American Dist. Tel. (Phila.).....	25	400,000	400,000	1 % Q.	26	27
People's Traction Co.....	50	10,000,000	16,000,000	8 % A. April, '98	150	151	Sell Teleph. Co. (of Canada).....	100	8,990,000	8,564,000	2 1/2 % Q.	189	—
Green & Conates Passenger Ry.	50	1,500,000	572,800	\$5.25 share—1898.	151	152	Chesapeake & Potomac Tel. Co.	100	—	—	—	47	70
People's Passenger Ry. Co.....	25	1,500,000	740,000	8 % Jan., 1898.	151	152	Chicago Telephone Co.....	100	—	—	—	200	110
Philadelphia Traction Co.....	50	30,000,000	120,000,000	\$2 p. sh., Oct. '98.	97	97 1/2	Central Dist. Frig. & Tel. Co. (Phila.)	100	750,000	750,000	—	48	50
Catherline & Bainbridge St.	50	1,000,000	1,000,000	\$6 share A—Mar. '98.	158	157	Empire & Bay States Telegraph Co.	100	—	—	—	78	76
Continental Pass. Ry. Co. guar.	50	600,000	600,000		—	—	Hudson River Telephone Co.....	100	2,000,000	2,000,000	1 % Q.	20	15
Philadelphia City Pass. Ry.	50	1,000,000	1,475,000	\$7.50 share July '9	100	208 1/2	Northwestern Telephone Co. guar.	50	2,500,000	2,500,000	1 1/2 % Q.	22	25
Philadelphia & Gray's Ry. RR.	50	1,000,000	298,650	\$8.50 share July '9	100	—	Providence (R. I.) Tel. Co.....	50	—	—	—	6	99
Philadelphia & Darr, Ry. guar.	50	750,000	420,000	\$12 share July '9	100	—	Southern New Eng. Tel. Co.....	100	8,000,000	8,000,000	—	—	—
15th & 16th Sts. Pass. Ry.	50	1,000,000	200,000	\$2 share July '98.	—	—							
Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	250,000	\$1 1/2 share, July '98	300	—							
Union Passenger Ry. Co.....	50	1,500,000	900,000	\$9.50 sh. July '9	149	240							
West Philadelphia Pass. Ry.....	50	750,000	175,000	\$10 share July '98	262	268							
Rochester, N. Y.—May													
Rochester Railway Co.....	100	5,000,000	5,000,000		59	21							
Reading, Pa.—May 18													
Reading Traction Co.....	—	1,000,000	1,000,000	Semi-ann. Jan. & J	24	26							
City Passenger Ry.....	50	850,000	850,000	Jan., '98.	138	—							
East Reading Electric Ry.....	50	1,000,000	11,000,000	Jan., '98.	70	—							
St. Louis Mo.—May 18													
Fourth Street & Arsenal Ry.....	50	800,000	150,000		—	—							
Jefferson Avenue Ry. Co.....	50	400,000	400,000	2 % Dec., 1898.	—	—							
Lindell Ry.....	100	2,500,000	2,400,000	1 1/2 % Jan., '99.	—	—							
National Railway Co.....	—	2,500,000	2,479,000	1 1/2 % Jan., '99.	—	—							
Cass Avenue & Fair Grounds.....	100	2,500,000	2,500,000		—	—							
City of St. Louis RR.....	100	2,000,000	1,500,000	4 % Oct., '98.	—	—							
St. Louis RR.....	100	2,000,000	2,000,000	2 1/2 % Jan., '99.	—	—							
Missouri RR.....	50	2,400,000	2,800,000	1 1/2 % Jan., '99.	24	24 1/2							
People's RR. Co.....	50	1,000,000	800,000	50c., Dec., '89.	79	—							
United Electric Ry.....	50	500,000	500,000		64	65							
United Electric Ry.....	100	1,000,000	1,000,000	3 % Jan., '99.	94	95							
St. Louis & Suburban Ry.....	100	800,000	2,500,000	8 % A. July, '99	—	—							
Union Depot RR.....	100	4,000,000	4,000,000		—	—							
San Francisco, Cal.—May 18													
California St. Cable RR.....	100	1,000,000	600,000	50c. monthly.	117	119							
Geary Street Park & Ocean RR.....	100	1,000,000	875,000	\$2.50 share, '96.	50	50 1/2							
Market Street Ry.....	100	18,750,000	18,750,000	Q. 60c. per share	61	68 1/2							
Presidio & Faries RR.....	100	1,000,000	550,000		—	16							
Scranton Pa.—May 18													
Scranton Railway Co.....	50	6,000,000	2,500,000		29	30							
Scranton & Carbondale Trac. Co.	100	500,000	500,000		16 1/2	—							
Scranton & Pittston Traction Co.	100	1,050,000	1,020,000		—	—							
Springfield Ill.—May 18													
Springfield Consolidated Ry.....	100	750,000	750,000		—	—							
Springfield O.—May 18													
Springfield Street Ry.....	100	1,000,000	1,000,000		—	11							
Springfield, Mass.—May 18													
Springfield Street Ry.....	100	1,200,000	1,166,700	8 % A.	207	212							
Toronto Canada.—May 18													
Toronto Street Ry.....	100	6,000,000	6,000,000	1 1/2 % S.	109 1/2	113 1/2							
Montreal Street Railway Co.....	100	4,000,000	4,000,000	4 % S.	279	280							
Washington, D. C.—May 18													
Capital Ry. Co.....	50	500,000	500,000		—	—							
Capital Traction Co.....	100	12,000,000	12,000,000	6 c. per sh. Oct	122 1/2	102 1/2							
Umbria Ry. Co.....	50	400,000	400,000	6 % A.	85	40							
Arlington & Soldiers' Home Ry.	50	707,000	652,500		20	21							
Georgetown & Tenallytown Ry.	50	300,000	200,000		—	—							
Metropolitan RR. Co.....	50	1,000,000	458,900	2 1/2 % Q.	—	—							
Worcester, Mass.—May 18													
Worcester Traction Co.....	100	8,000,000	8,000,000		124	25							
Worcester Traction Co.....	100	2,000,000	2,000,000	8 % S., Feb.	27	28							
Worcester & Suburban Street Ry.	100	550,000	542,500	4 % Q.	—	85							
Wilkesbarre, Pa.—May 18													
Wilkesbarre & Wyoming Val Trac.	100	5,000,000	5,000,000	1 % Jan.	25	26							

* Unlisted. † Paid in. ‡ Full paid. § Outstanding. ¶ Ex-div.
 a Leased to Hestonville, Man. & Fairmount Passenger Ry. for 6 % on stock per annum.
 b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
 c Practically all shares owned by Union Traction Company.
 d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
 e Leased to Electric Traction Company.
 f Controlled by Frankford & Southwark Passenger Railway.
 g Leased to People's Passenger Railway at \$5 per share.
 h Majority of stock owned by People's Traction Company.
 i Leased to Union Traction Company.
 j Lease transferred to Union Traction Company.
 k Leased to Union Traction Company at a rental of \$10,000 per annum in 1866-7-8, \$20,000 in 1879-1900 and \$30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.
 l Dividend of 10 % guaranteed by Reading Traction Company.
 m Dividend of 6 % guaranteed by Reading Traction Company.
 n Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

Boston, Mass.—May 18										115	125
Fort Wayne Electric trust receipts..	..	.....	.....	.....						15	25
St. Wayne Elec. Co. T. Sec. Series A.	25	.....	.....	.....							
General Electric Co. (old) .. com.	100	40,000,000	80,460,000	2 % Q., Aug., 1898.						228	238 1/2
General Electric Co. (new)	100	18,276,000	18,276,000	1 1/2 % Q., Apr., 1901						22	24
T. H. Elec. Co. T. Secur., Series C.	..	.....	.....	.....						25	26 1/2
Westinghouse Elec. & Mfg. Co. com.	50	.....	146,700	.....						75 1/2	76
Westinghouse El. & Mfg. Co. pfd.	50	4,000,000	8,996,068	1 1/2 % Q., Jan.,						15 1/2	15 1/2
Westinghouse El. & Mfg. Co. rights.	50	11,000,000	8,195,126	.....							
New York.—May 18											
Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	.....						119	120
Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1 1/2 % Oct., '98.						8	12
Edison Ore Milling Co.....	100	.....	.....	.....						..	..
Electric Vehicle Co.....com.	100	.....	.....	.....						..	..
General Electric Co. (old) .. com.	100	40,000,000	80,460,000	2 % Q., Aug., 1898.						223	228 1/2
General Electric Co. (new)	100	18,276,000	18,276,000	1 1/2 % Q., Apr., 1901						41	..
Interior Conduit & Insulation Co..	100	1,000,000	1,000,000	.....						110	126
Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.							
Pittsburg, Pa.—May 18											
Allegheny County Light Co.....	100	500,000	500,000	J. & J						166	172
East End Electric Light Co.....	50	800,000	800,000	Q						..	..
Philadelphia, Pa.—May 18											
Edison Electric Light Co.....	100	2,000,000	.....	.....						144	141
Electric Storage Battery Co. com.	100	8,500,000	.....	.....						64	65
Electric Storage Battery Co. pfd.	100	5,000,000	.....	.....						68	66
Northern Elec. Light & Power Co.	10	550,000	550,000	.....						16	18
Southern Elec. Light & Power Co..	10	187,500	187,500	.....						80	..
Miscellaneous.—May											
Bridgeport (Conn.) Elec. Lt. Co....	25	500,000	.....	.....						47	45
Missouri-Edison (St. Louis) Co....	100	.....	.....	.....						20	21
Eddy Electric Mfg. Co.....	25	.....	.....	.....						9	12
Hartford (Conn.) Elec. Light Co....	100	850,000	.....	.....						90	109
Hartford (Conn.) Lt. & Power Co....	25	175,000	.....	.....						6	10
New Haven (Conn.) Elec. Lt. Co....	100	100,000	.....	.....						196	..
Narragansett (Prov. R. I.) Elec. Co.	50	1,200,000	.....	.....						102	101
Rhode Island Elec. Protec. Co.....	100	.....	.....	.....						118 1/2	120
Royal Elec. Co. (Montreal)	..	1,225,000	.....	.....						120	251
Toronto (Canada) Elec. Light Co....	100	1,095,000	1,068,000	1 1/2 % Q						88	88
Thomson-Houston Welding Co.....	100									100	100
Woonsocket (R. I.) Electric Co....	100									106	108

PASSENGER RAILWAY.

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PASSENGER RAILWAY.

NAME.	Amount.		Date	Interest periods.	Bid.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—May 18 1901						
Jefferson Avenue Ry.....1st mtg. 6s.	270,000	270,000	1905	M. & N.	112	113
Lindell Ry. Co.....1st mtg. 6s.	1,000,000	1,500,000	1911	F. & A.	117	118
Missouri RR. Co.....	1,000,000	700,000	1916	M. & S.	106	106
Mount City RR. Co.....1st mtg. 6s.	400,000	800,000	1910	A. & O.	104½	105½
People's RR. Co.....1st mtg. 6s.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 7s.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric.....1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 6s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
St. Louis & Sub. Ry.....1st mtg. 6s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5s.	800,000	800,000	.....	.....	80	84
Southern Electric Ry.....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
Taylor Avenue St. Ry.....1st mtg. 6s.	500,000	500,000	1918	J. & J.	116½	117½
Union Depot RR. Co.....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.....Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122
Controlled by St. Louis RR. Co.						
Controlled by Union Depot RR. Co.						
Controlled by Lindell RR. Co.						
\$500,000 in escrow to retire 1st & 2d mtg.						
\$500,000 in escrow.						
\$500,000 in escrow to retire 1st mtg. bds.						
San Francisco Cal.						
Date of Quotation—May 18 1901.						
California St. Cable RR.....1st mtg. 6s.	1,000,000	900,000	1915	J. & J.	114	117
Ferris & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	.....	117
Geary St., Park & Ocean RR.....1st mtg. 6s.	1,000,000	671,000	1921	A. & O.	.....	96
Market St. Cable Ry. Co.....1st mtg. 6s.	8,000,000	8,000,000	1918	J. & J.	126½	.....
Metropolitan Ry. Co.....1st mtg. 6s.	200,000	.....	.....	.....	.....	.....
Omnibus Cable Co.....1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	.....
Park & Cliff House RR.....1st mtg. 6s.	850,000	850,000	1912	J. & J.	106½	107
Park & Ocean RR.....1st mtg. 6s.	250,000	250,000	1914	J. & J.	115	.....
Powell St. Ry.....1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	126
Water St. Ry. Co.....1st mtg. 6s.	1,000,000	900,000	1918	M. & N.	.....	.....
Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—May 18, 1901						
Belt Ry. Co.....Cons. mtg. 6s.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 6s.	500,000	500,000	1914	A. & O.	129	.....
Exington & Soldiers' Home.....1st mtg. 6s.	300,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	.....	.....
\$500,000 in escrow to retire 1st mtg. bds.						
Miscellaneous						
Date of Quotation—May 18, 1901						
Bridgeport Traction Co.....1st mtg. 6s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 6s.	5,000,000	5,542,000	1931	F. & A.	118	.....
Chenango St. Ry. (Ind. pols.) 1st cons. m. 6s.	4,000,000	5,000,000	1938	M. & N.	104	106
Crotona St. Ry. (Buffalo) 1st mtg. 6s.	8,000,000	3,866,000	1932	M. & N.	112	118
Columbus (O.) St. Ry. 1st cons. m. 6s.	8,000,000	2,261,000	1932	J. & J.	115	.....
Consolidated Traction (N. J.) 1st mtg. 6s.	15,000,000	12,965,000	1938	J. & D.	111½	111½
Crotona St. Ry. (Col'ds, O.) 1st mtg. 6s.	2,000,000	872,000	1920	J. & D.	115	116½
Denver City Cable Ry.....1st mtg. 6s.	4,000,000	8,800,000	1920	J. & J.	20	.....
Denver Tramway Co.....Cons. m. 6s.	4,000,000	922,000	1938	A. & O.	80	86
Louisville (Ky.) Ry.....1st cons. mtg. 6s.	6,000,000	4,981,000	1930	J. & J.	119	119½
Minneapolis St. Ry. 1st cons. mtg. 6s.	5,000,000	4,050,000	1919	J. & J.	110½	110½
No. Hudson Co. Ry. (N. J.) Cons. mtg. 6s.	8,000,000	2,878,000	1928	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.) 2d mtg. 6s.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.) Deb. 6s.	500,000	489,000	1902	F. & A.	.....	.....
Paterson (N. J.) Ry.....Cons. mtg. 6s.	1,250,000	1,000,000	1931	J. & D.	.....	.....
Rochester (N. Y.) Ry.....1st mtg. 6s.	5,000,000	2,000,000	1930	A. & O.	.....	.....
St. Paul City Ry.....Cons. g. 6s.	5,500,000	4,298,000	1937	.....	106½	106
St. Paul City Ry.....Deb. g. 6s.	1,000,000	1,000,000	1900	.....	108	.....
\$11,000,000 in escrow to retire 1st and 2d mtg. bds.						
\$300,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
\$100,000 in escrow to retire bonds of O. St. RR. Co.						
\$37,000 in treasury.						
\$200,000 reserved to redeem prior liens.						
\$230,000 in escrow.						
*with Int'l						

*With Int' res

ELECTRIC LIGHT AND ELECTRIC MFG. COs

Boston, Mass.						
Date of Quotation—May 18, 1901.						
Delaware Gas Lt. Co.....1st m. 6s. g.	800,000	800,000	.....	J. & J.	106	106
Edison Elec. Illuminating Co., Boston.....	2,026,000	.....	.....	Quar.	187	.....
General Electric Co. gold coup. deb. 6s.	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa.						
Date of Quotation—May 18 1901.						
Allegheny County Light Co.....6s.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Scrip 6s.	196,570	.....	.....	M. & S.	.....	.....
Miscellaneous. —(May 18 1901.)						
Edison El. Ilig. Co. (N. York) 1st m. 6s.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilig. Co. (N. Y.) con. m. g. 6s.	18,000,000	2,188,000	1938	.....	124	.....
Edison Elec. Ilig. Co. (Brooklyn).....	6,000,000	5,000,000	1940	.....	122½	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Pow. Co. 1st mtg. 6s.	2,500,000	.....	1937	A. & O.	100	101
Kings Co. El. Lt. & Pow. Co. pur. money 6s.	5,178,000	.....	1937	A. & O.	120	122
Milwaukee El. Ry. & Lt. Co. 1st con. g. 6s.	8,000,000	.....	.....	F. & A.	102½	.....
United Elec. Light & Power Co. (N. Y.).....	8,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—May 18, 1901.						
American Bell Telephone.....4s.	.....	.....	1908	F. & A.	100½	101
Northwestern Telephone Co.....7s.	.....	.....	.....	.....	114	115
N. Y. & N. J. Tel. & Tel. Co. gen. mtg. 6s.	.....	.....	1911	J. & D.	108	116
Chesapeake & Potomac Tel. Co.....6s.	.....	.....	.....	.....	.....	.....

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—May 18 1901.						
American Electric Heating.....7s.	500,000	500,000	.....	.....	.....	25
Armington & Sims Engine Co.....6s.	.....	.....	.....	.....	.....	107
Barray & Smith Car Co.....6s.	.....	.....	1942	J. & J.	106	107
Carborundum Mfg Co.....6s.	75,000	.....	1904	J. & D.	.....	.....
Worthington Pump Co.....6s.	.....	.....	.....	.....	116	127
Unlisted						
Nomina.						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½¢@16¾¢; Lake, 17¢@17½¢; casting, 16½¢@16¾¢.

The Canton, Massillon & Akron Railroad Company has increased its capital stock from \$1,000 to \$1,000,000.

The Kings County Electric Light & Power Company has declared the regular quarterly dividend of 1½ per cent.

April gross earnings of the Pittsburg Consolidated Traction Company increased \$4,460, while net earnings decreased \$7,612.

Boston Elevated people speak highly of the "Sprague multiple unit control" now in use on the Elevated lines. They say that the Sprague apparatus is working perfectly.

The Union Railway Company of New York reports for the quarter ended March 31: Gross earnings, \$194,091; expenses, \$144,916; net, \$49,145; charges, \$33,912; surplus, \$15,233.

Metropolitan Elevated of Chicago is understood to be out of the arrangements for consolidation. The supposition is that some Metropolitan interests regarded the Lake Street load as too heavy.

The Gas & Electric Company of Bergen County, N. J., reports for April: Gross earnings, \$18,047; operating expenses, \$11,855; net earnings, \$6,192; from June 1, 1900, to April 30, 1901, gross earnings, \$216,933; operating expenses, \$138,184; net earnings, \$78,749.

The following are quotations for some of the industrial stocks not quoted elsewhere: Electrical Lead Reduction, 4½¢@5¢; Electric Boat, 14¢@17¢; Electric Vehicle, 10¢@12¢; Tel. & Tel. Company of America (full paid) 5¢@7¢; Electric Company of America, 9½¢@9¾¢; National Carbon, 15¼¢@16¢.

Progress is being made with the electrical equipment of the Manhattan Elevated system in this city and from this excellent results are expected. With open, swiftly moving cars, it is anticipated that the summer business, which is now comparatively small, can be kept up to the level of the winter months.

The proceeds of the proposed \$2,000,000 increase in the capital stock of the Bell Telephone Company of Philadelphia, which the stockholders will be asked to ratify at a meeting this month, will, it is stated, be expended chiefly on the Delaware & Atlantic system, owned by the Philadelphia Bell Company.

A dispatch from Boston states that the Attorney-General has rendered a decision that the bill permitting the consolidation of the Edison Electric Illuminating Company and the Boston Electric Light Company does not conflict with the bill permitting similar consolidations when sanctioned by the Gas Commissioners.

Some very conservative people who have hitherto not been identified with movements in Brooklyn Rapid Transit now announce themselves bullish on the stock. Competent authorities say the physical condition of the property is excellent and the company is strong in funds without material increase in annual obligations.

The American Light & Traction Company, which was incorporated at Trenton, N. J., in April for \$2,000, has increased its capitalization to \$400,000. There will be issued preferred stock to the amount of 250,000 shares, valued at \$25,000,000, and common stock to the amount of 15,000,000 shares, valued at \$15,000,000.

The Atlantic Wireless Telegraph & Telephone Company was incorporated on May 16 by Richard P. Simpson, Robert E. Lee Cunningham, Harry B. Cook, William F. Taylor, William I. Cook, Charles H. McDonnell and William Byrne. The stated capital is \$5,000,000, divided into 5,000,000 shares of \$1 each. It is said that the promoters of the company have the rights for the Marconi system in Maryland, the Virginias and the Carolinas.

After the meeting of the American Telephone & Telegraph Company directors on May 15 in Boston it was announced that Mr. T. B. Bailey had resigned to make room on the board for Mr. F. P. Fish, the new president. Mr. Bailey is purchasing agent for the company. The fact that the session was an unusually long one has led to the impression that something besides "routine" business was transacted. There are strong intimations in banking circles that an additional issue of stock is shortly to be announced.

The Boston "News-Bureau" states that it is probable that the shareholders of the General Electric Company will shortly receive valuable rights in connection with the readjustment of the capital stock of the company. The new board of directors is as follows: Gordon Abbott, Oliver Ames, C. A. Coffin, T. Jefferson Coolidge, Jr., Frederick P. Fish, George P. Gardner, Eugene Griffin, Henry L. Higginson, J. Pierpont Morgan, J. P. Ord, Robert Treat Paine, 2d, George Foster Peabody and Charles Steele. The company has declared the regular quarterly dividend of 2 per cent. on its common stock, payable July 15 to stock of record June 14.

Both Electric Company of America and American Railways interests, who are participating in the consolidation negotiations, now say that the plan has been practically agreed to, and that it is likely to be in shape for announcement to stockholders this week. Under the plan the new company to take them over will have about \$12,000,000 4 per cent. collateral trust bonds and \$4,000,000 common stock. There will be no preferred stock. Besides the bonds which stockholders get in exchange for their present stock, they will be allowed to subscribe to \$2,500,000 additional bonds at par, and a 35 per cent. bonus in new common stock, for cash, issued to provide new cash capital. These bonds will be underwritten. The exchange of the 75,000 shares of the American Railways Company stock at 55 makes up \$4,125,000 of the new bonds, and the 400,000 shares of Electric Company of America stock outstanding takes up \$4,600,000, which together with the \$2,500,000 to be sold for cash makes a total of \$11,225,000 to be issued.

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EDITORIAL NOTES.

The Twentyfourth Convention of the National Electric Light Association.

respect. The attendance was unusually large,
which was to have been expected in view of
the attraction at Buffalo.

The papers read and reports presented were
almost without exception of a high order of
merit and of a practical nature, and elicited
discussions that should prove of great value to
the industry. Among the reports and discus-
sions two that deserve special mention were
those on "The Standard Candle Power of In-
candescent Lamps," and on "Amendments to
Freight Classification of Electrical Apparatus."
These subjects were gone into in a most
thorough and exhaustive manner and were
discussed at great length.

The Pan-American Exposition was visited
by the members en masse and a number of
manufactories at the Falls employing electric
power were inspected. Taking it all in all, the
Twenty-fourth Convention will go down in his-
tory as a most instructive and enjoyable gather-
ing.

The proceedings will be found elsewhere in
this issue.

The Library of the Late Latimer Clark.

on the evening of May 21, Prof. Schuyler S.
Wheeler donated to the Institute library the
entire collection recently purchased by him
from the executors of the estate of the late
Latimer Clark, who was one of the founders
of the British Society of Telegraph Engineers
and its president in the year 1875.

The library contains 7,000 volumes, covering
practically every book treating of electricity
printed up to 1886. Many of the volumes are
so rare that special provision is made for their
preservation in the deed of gift by Prof.
Wheeler.

The general terms of the deed of gift, as
made public, are that the Institute shall pro-
vide a suitable place to keep the library, ap-

The Convention of
the National Electric
Light Association,
which has just drawn
to a close at Niagara
Falls, proved most
satisfactory in every

propriate \$1,500 a year for its care and that it
shall be free to the use of all, and open for use
upon some evenings and Sundays.

It is understood that just before sailing for
Europe Mr. Carnegie promised a member of the
Institute that if Dr. Wheeler gave the Clark
library he would give an equivalent amount of
money for the utilization of the treasure.

The Institute is certainly to be congratu-
lated that through the generosity of Prof.
Wheeler, it becomes possessor of a collection
of books that will prove invaluable to the elec-
trical fraternity. Such a library has been
much needed by the Institute, and will prove
invaluable as a means of reference and re-
search.

The Electrical Features of the Glasgow International Exhibition.

The exhibition which was
opened at Glasgow, Scot-
land, on May 2, and which
will close next November,
is now pretty well com-
plete, and engineers from
all parts of Great Britain
will be shortly flocking to the so-called "model
city" in fair numbers. The year's programme
of scientific and engineering societies' visits to
the city and exhibition is a very full one. The
fact that the Municipal Electrical Association
holds its three days' convention there in June,
the British Association its week's congress in
September, the joint convention of all British
engineering societies, including the Institu-
tion of Electrical Engineers, in the same month,
and sundry other societies between now and No-
vember next, indicates that the electrical and
engineering exhibits will be visited by the
very men with whom the manufacturer wants
to get into touch. In the "Machinery Hall,"
where nearly all the features of electrical in-
terest are to be found, the exhibits are mainly
of British origin, but there is a proportion of
Continental and American, although these con-
sist chiefly of machine tools. There is an ex-
cellent pavilion erected in the grounds by the
British Westinghouse Company with a repre-
sentative exhibit of their large gas engines
for driving electric generators, electric cars,
switchboards, motors, etc. There are several
other pavilions in the same neighborhood, one
containing some good specimens of the tools
made by the Bullard Machine Tool Company
of America, and one containing a full exhibit
of Schuckert machinery and material by the
British Schuckert Electric Company. It
would hardly prove of interest to American

electrical engineers to quote the names of the hundreds of firms who are represented nor to catalogue their various exhibits in detail. To an Englishman making a general tour round among them, says our London correspondent, there are signs of a far greater degree of enterprise than has sometimes been shown by British engineering firms when opportunities have arisen for them to keep themselves pushed well forward. The best electrical engineering firms show examples, some of them very large, of the best and most recent English electrical practice.

The Clarke-Stevenson long wall disk type of coal cutting machine, which is being used in quite a large number of English collieries is shown by the firm of Clarke, Stevenson & Co. The "Reavell" steam engine is one which has lately been pushed for electric lighting purposes, and it is shown driving a 50 kw. two-phase alternator of the Fowler Hall type. Messrs Reavell also exhibited electrically driven compressors. Messrs. Bruce, Peebles & Co. of Edinburgh have a 150 hp. electric driven motor driving a main shaft in the Hall, and among their exhibits are found water tight mining motors (60 B.H.P.), motor-driven capstans, the Peebles Willans' train lighting equipment, and Peebles-Belliss steam driven generators (350 kw.) for central electric lighting stations. The Fynn patent direct and alternating motors and generators are placed on view by Rosling, Appleby & Fynn, Ltd., and the Electrical Company, Ltd., who are the British representatives of the Allgemeine Electricitäts-Gesellschaft have a varied exhibit of electrical machinery and instruments. Fourteen clocks in different parts of the exhibition are driven electrically from the stand of Messrs. Barr & Stroud, which firm also exhibits range-finders for military and naval service, and electric ships telegraphs. Messrs. Dick, Kerr & Co., whose name can hardly be quoted apart from the English Electric Manufacturing Company, and the Electric Tramway and Carriage Works Company, whose very large works were so recently set running at Preston, has a quantity of electric traction material, large electric generators and motors, and so on, manufactured by these two companies.

Messrs. Mavor & Coulson have placed on view some electric plunger pumps, drilling and coal cutting machines, central station generators, their concentric wiring system and other things. Messrs. Duncan Stewart & Co., whose name is standing out somewhat prominently among English electric tramway engine builders in connection with the Glasgow and Kalgoorlie (West Australia) power stations have a noteworthy show, McCallum's patent internal combustion engine, which produces power by the direct combustion of coal without steam boilers, being its leading feature. The engine is being shown in operation for a short time daily. Electrically driven centrifugals and refrigerators are also shown by Messrs. Stewart.

Perhaps the two largest exhibits are those of Messrs. Clarke Chapman & Co. and Messrs. Mather & Platt. Neither is exclusively electrical but each covers a good deal of steam engineering equipments for a variety of classes of work. Electric generators, winches, polyphase motors, projectors, etc. are included at Clarke Chapman's, and multipolar and other electrical machinery for lighting, power and traction work are placed by Mather & Platt.

A 200 kw. three-phase alternator (5,000 v. pressure), built by the Lancashire Dynamo and Motor Co., is shown driven by a vertical compound inclosed engine made by Hick Hargreave & Co., whose name will be remembered as that of a successful tenderer for the now famous Glasgow tramway engine plant contract. A "Peel-Hawkins" standard multipolar dynamo is shown running coupled to a high speed "Peach" engine.

The Ericsson Telephone Co., who have supplied a number of instruments, etc., in connection with the municipal telephone system of Glasgow which has just been started, have a variety of interesting stuff, including specimens of the Glasgow apparatus. This is an exhibit which will interest municipal electricians this summer in view of the strong feeling in certain parts of England in favor of local municipal exchanges.

There is no doubt that many electrical engineers will find the plant which supplies the exhibition with its light and power of far more practical interest. Just off the Machinery Hall a boiler house with the most up-to-date equipment of different types of steam plant, including water-tube, marine and Lancashire, also hand and mechanical firing, furnishes about 5,000 hp., and this drives about a dozen various types of combined (all direct coupled) generators just inside the Machinery Hall but rallied apart from the ordinary exhibits.

The Machinery Hall is lighted by 250-10 ampere Brockie-Pell arc lamps, and there are altogether getting on for a thousand lamps of this type used in the lighting of the different departments as well as many incandescents. The grounds are lighted, however, for the most part by Welsbach high pressure gas and Kitson high pressure oil, and Scott-Snell high pressure gas. The grand avenue is lighted by 105 Brockie-Pell arcs, and in some of the gardens 90 are employed, the overhead wiring here used being aluminum.

Many electric motors are of course distributed throughout the different departments, and are doing all kinds of work in connection with the different exhibits in the machinery and industrial halls.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

It is reported that Guglielmo Marconi will soon be subject to military duty. The law of Italy is imperative upon this subject, and he cannot evade it. The King, however, has promised to assign him to duty on a naval vessel where he can continue his experiments looking toward the perfection of his system of wireless telegraphy.

THE degree of Bachelor of Science in Electrical Engineering will be offered hereafter at Brown University, Providence, R. I. The equipment of the electrical department has been recently increased by the purchase of a number of pieces of electrical machinery.

ACCORDING to a foreign contemporary the French company which towards the end of 1899 placed a number of electric motor cabs on the streets of Paris, has gone the way of its confrères in England and America. The experiment has proved altogether unprofitable, and it is said that a sum of \$900,000 has been sunk

in the attempt to obtain the approval of the public to an electric cab service in Paris. The failure of the concern is attributed to various causes, among others, the high cost of maintaining the accumulators and the consequent excessive scale of charges which had to be enforced.

ON May 23, five thousand skilled laborers employed in constructing the underground rapid transit road in this city quit work. As a result everything connected with the tunnel is at a standstill and it is claimed that the recent heavy rains have caused considerable damage.

THE Broadway line of the Metropolitan Street Railway Company of this city was converted from cable to electricity on Sunday night and Monday. This was the last of the cable lines to be done away with.

FOR some time past the Illinois Central Railroad has been engaged in the construction of an electric lighting plant for the purpose of lighting the stations along the tracks of the Chicago terminals. All the stations between Flossmoor, Ill., and Randolph street, Chicago, will be lighted with incandescent electric lights, and arc lights will be used in front of the stations. Electric lights will also be used at points about the yards.

UP to the present the application of electric light on railways in India has not made very great headway. A good sign of the development, however, which this branch of the industry is sure to enjoy sooner or later in that country, is the announcement that the Bombay Electric Company has entered into an agreement for lighting the through carriages of the Rajputana-Malwa mail trains between Ahmedabad and Delhi.

AT the Academy of Medicine in Paris, a short time ago an extraordinary contrivance by a dentist of that city was exhibited, the object being to render the extraction of teeth both pleasant and painless. At the same time that the laughing gas is applied a phonograph begins to reproduce musical selections. The practitioners have noticed that when the gas is administered alone many of the patients experience very disagreeable sensations, but these, it is claimed, can be prevented or overcome by means of music.

A PARTY of ten Californian automobilists recently indulged in a wildcat hunt. They followed the hounds as closely as possible, the country being favorable to the operation of the vehicles, and had the satisfaction of bagging a dozen of the felines.

IN a report to the State Department Consul General Guenther at Frankfort, Germany, says: "The association for the study of electric rapid transit railroads has made its report for 1900, and among other things it is stated that the elevated track of the military road between Berlin and Zossen, upon which experiments will soon be made, has been carefully inspected and strengthened. It is hoped to attain a speed of 125 miles per hour. Two cars will be employed, which are supplied with the strong machines required, and will hold from forty to fifty passengers. The construction of the cars and their equipment differ, in order to make manifold experiments. Each car will have four motors, aggregating from 1,000 to

National Electric Light Association.

Large Attendance at the Twenty-fourth Convention.

HENRY L. DOHERTY ELECTED PRESIDENT.

Many Important Papers Read and Discussed
—Reports of the Secretary-Treasurer and
Various Committees—Sketch of the New
President

The delegates to the Twenty-fourth Convention of the National Electric Light Association began to arrive at the International Hotel, Niagara Falls, as early as Monday, May 20. On Tuesday morning at 10:45 President J. Blake Cahoon called the meeting to order and read an address, which was in part as follows:

The President's Address.

Members of the National Electric Light Association.

Gentlemen: It becomes my pleasant duty, in the first year of the new century, to greet you at this historic place, now peculiarly of interest to the electrical fraternity by reason of the partial harnessing of the great Falls of Niagara, rendering them useful and subservient to the demands of man. Yet, while we know that thousands of their horse power are being utilized, which one of us, standing by their side and listening to their mighty roar, can detect this change? They seem to hurl back defiance at the puny attempts of man to control their restless energy. What will be the answer of man at the close of the twentieth century?

We are wont to class Niagara as the greatest water power in the world, yet it is only as the boy to the man, compared with some others. For instance, the Victoria Falls on the Zambesi River in the Dark Continent have a fall of 391 feet and a width of 3,200 feet, while Niagara has only 177 feet fall and a width of 1,968.

Long distance transmission of electricity has become a well-established fact, and as high as 60,000 volts have been successfully transmitted, while the distance has been steadily increasing.

The Snoqualmie Falls Power Company, of Seattle, Wash., recently operated a motor by means of current transmitted over a circuit 153 miles in length; the results obtained being so satisfactory as to demonstrate fully the feasibility of the plan.

In all parts of the country man is at work utilizing the water powers that nature has provided, which until the advent of electricity were in a great measure unavailable for his work. Those of our Association who can recall the early days of central stations, when a few hundred horse power were sufficient for the demand, may well feel amazed at the wonderful strides that have been made in their development during the closing years of the nineteenth century; but as the mind of man expands and develops, so will his ability to grasp higher and greater problems carry him on into those larger fields in the face of which our present works will appear even more primitive and puny than do now the central stations

of the early days. As Shakespeare well says, "We must construe the times to their necessities."

In taking a retrospective glance over the past year, we are struck with the fact that but little has been brought out that marks any distinct advance in apparatus. It is as though our associate members in the manufacturing field had taken the good house-wife for an example, and had been cleaning here and dusting there, clearing away the cobwebs; I hardly dare say getting the "bugs" out of things, for no good housekeeper would admit that there were such things in her house; nevertheless, technical "bugs" have appeared, and must be gotten rid of before apparatus is perfected, and so, apparently, our manufacturers have been busy setting their house in order preparatory to the next great step in advance.

Turning to the field of invention, we see a few bright rays peeping forth, just enough to nourish the hope, ever latent in our breast, that some better method of illumination is to be given us. Experiments have been carried on with the Nernst lamp with a view to reducing it to a commercial basis, and we may soon look for its appearance in a practical condition for ordinary use.

Ewald Rasch, a German, has brought out an arc lamp, somewhat similar in principle to the Nernst lamp, in that the carbon rods are replaced by rods of refractory material, such as the oxides of thorium, zirconium, magnesium, etc. These require heating before they will work, which is, of course, objectionable, but they possess the great advantage that the electrodes are permanent and do not require renewal. The efficiency is claimed to be about double that of the ordinary carbon arc lamps. By changing the material of the rods the character of the light emitted may be varied.

At the *Conversazione* of the American Institute of Electrical Engineers, held April 12, 1901, Mr. Peter Cooper Hewitt exhibited a method of lighting by vacuum tubes in which mercury had been placed. Upon current being applied from a 115 volt circuit, the mercury was first vaporized and then the vapor heated up to a point where it emitted a light so powerful, and of such a color, as to make the light from an ordinary inclosed arc lamp look like that given forth by a common gas jet. This is not in commercial form, as the light is very objectionable on account of its ghastly green effect; but experiments are now being carried on with other metals, and we may look for a successful issue in the very near future, for we of this day do not question the value of experiments as people did a century ago. In this connection, you will all recall an incident of Franklin's career, when he replied to a man that spoke rather contemptuously in his presence of Montgolfier's balloon experiments: "Of what use is a new born babe?"

When you visit the great Pan-American Exposition, and behold the marked advance that has been made in the arts and sciences, even since the World's Exposition at Chicago, just think for a moment that this could not have taken place except through a series of experiments taxing the brain and the patience of genius, as well as the pocket book of capital. Both have given freely, and the world has attained a higher degree of civilization by reason thereof.

Our committee reports will be presented for your consideration and action. There is not

3,000 horse power; two three-axle movable trucks, and the necessary transmuters, switching apparatus, etc. The cars will be about seventy and one-half feet long and will weigh about ninety tons. The experiments will doubtless prove of the highest importance for the improvement of rapid transit, although it may be found that the speed contemplated will not be feasible."

A DISPATCH from abroad states that experiments have been made between Berlin and Hamburg with the system of rapid telegraphy of Professor Rowland, of Baltimore. The results are most satisfactory, the new system easily doing double the amount of work done by the Baudot apparatus. The German Postal Department intends to introduce the Rowland system between Berlin, Hamburg, Cologne, Leipsic and Frankfurt.

A REPORT from Milwaukee, Wis., announces that the Peré Marquette Steamship Line is planning to furnish its seven vessels with a system of wireless telegraphy, to enable communication with the vessels while on the lake.

THERE is a strong probability that within a few months a wireless telegraph system will be in operation between Portland, Me., and Boston, Mass. Dr. J. P. Wentworth, in the interest of the New England Wireless Telephone & Telegraph Company, states that it is the Company's intention to establish not only a Boston service but to open stations in all the principal cities and towns of Maine. The system which the company uses, is known as the Dolbear system.

DR. A. SCHWEITZER describes in the "Elektrotechnische Zeitschrift" the results of some investigations which he has made to determine the influence of aluminum on the magnetic qualities of cast-iron when admixed in varying quantities. The ballistic method was used in making the observations, says the London "Electrical Engineer." From a table of the results of the observations in relation to the curves of the induction which the writer gives, it is seen that the curves of the induction become flatter as the proportion of aluminum is increased, losing gradually the characteristic form of the induction curve of the iron. For field strengths down to $H = 40$ the decrease of the induction is almost parallel to the increased proportion of aluminum. From $H = 11.6$ to $H = 3.6$ the induction with 2.45 per cent. admixture of aluminum is greater than the corresponding values for an induction of 1.62 per cent. The curves of the permeability also lose their characteristic form with increased proportions of aluminum; their maximum becomes smaller and the curves much flatter. The losses due to hysteresis increase with the larger proportions of aluminum, the curves of the losses as a function of the induction becoming increasingly pointed. For an induction $B = 3,000$ the hysteresis losses increase parallel to the increased proportions of aluminum, but for higher inductions they increase at a greater rate relative to the increase of aluminum. The results of the observations may be summed up briefly as follows: admixtures of aluminum with cast-iron effect a decrease of the induction for equal field strengths and an increase of the hysteresis losses for equal inductions. The magnetic qualities of the iron, in fact, are lessened in value.

one of them but has a practical bearing upon the work of this Association, and I urge that you give them most careful consideration. The papers that have been prepared are by men that speak with authority on the subjects in hand, and I wish to express to the authors my appreciation of the cordial response that they have made to our demands upon their time.

Every combination of circumstances seems to be in favor of this being the best Convention this Association has ever held, and I hope everyone present will depart at its close with the feeling that he has been well repaid for dropping his work temporarily and joining together here with others in a mutual endeavor to give and receive knowledge that will be of benefit to each and all of those interested in the work of this Association. (Applause.)

President Cahoon—I now declare the Twenty-fourth Convention of the National Electric Light Association open and request the Secretary to read the notices that we have. As Mr. Van Trump is unable to be here this morning, the paper of Mr. Calvin W. Rice will be substituted for it. One of the resolutions is not quite ready, and I will therefore ask Mr. Rice to be kind enough to read his paper.

Calvin W. Rice, New York—Mr. President and gentlemen: Before reading the paper I think it well to explain that on so large a subject I have not attempted to speak of everything in detail. The difficulty seems to be to judge how much to leave out rather than how much to put in.

Mr. Rice then proceeded to read his paper, entitled "Distribution of Current at High Potential in New York City." [The paper is printed in this issue of *ELECTRICITY*.]

A short discussion ensued in which Messrs. Nicholls and Rice took part.

President Cahoon—I hope you gentlemen will not let the first papers escape you, but that you will discuss them fully. There is one objection to reading the first paper or two at a meeting, and that is that the members do not seem to warm up to the fact that the papers are read for the purpose of picking them to pieces and getting out what meat there is in them. We would be glad to hear from anyone else who would like to discuss this subject. I want to say, gentlemen, in regard to the arrangement of the programme that an endeavor will be made to carry forward the business of the meeting at this session, this afternoon and the session to-morrow morning, so as to leave to-morrow afternoon clear. It has been suggested that the members attend the Pan-American Exposition to-morrow afternoon in a body, and arrangements will be made for a special provided enough members signify their wish to go in that way.

Mr. Scott—It seems to be the unanimous idea that we shall attend the Exposition in a body. I would say that we should have at least 100 go in order to obtain the privilege of a special train.

A rising vote was called for on the question and the President decided that it was carried unanimously.

A suitable resolution was then offered and adopted in regard to the death of Z. T. Gramme, the famous inventor, who was an honorary member of the Association.

President Cahoon—In furtherance of our purpose to advance the programme, I will now call on Mr. L. R. Wallis for a paper in regard to the charge for current.

The paper was then read, after which a short discussion ensued in which Messrs. Walker and Slade took part.

Mr. George E. Tripp of Boston, chairman of the Committee on Uniform Accounting, next made his report. The subject was discussed at length. It was moved and carried that the report be received.

The Secretary read letters of regret at their inability to attend from the following gentlemen: Lord Kelvin, London; Prof. Henry T. Bovey, Montreal; Prof. Edward L. Nicholls, Ithaca, N. Y.; Elihu Thomson, Lynn, Mass.; Charles F. Brush, Cleveland, and Henry L. Doherty, Denver, Col.

A communication from the Niagara Falls Power Company, extending a cordial invitation to the members of the Association to visit the power house and plant of the company, was also read. The invitation was accepted with thanks.

The meeting then adjourned until 2:30 P. M.

TUESDAY—AFTERNOON SESSION.

The President called the meeting to order at 2:45 o'clock.

President Cahoon—The first paper to be read this afternoon is that by Mr. Willcox on "The Practical Side of the Incandescent Lamp."

The paper was then read and discussed.

President Cahoon—As there are no other questions, I have one or two announcements to make. A letter from Mr. Morgan, general manager of the Niagara Gorge Railroad Company, which reads as follows:

"Gentlemen, it gives me great pleasure to tell you that I will be able to arrange an electric illumination of the Whirlpool Rapids on the Great Gorge Route this evening, and I beg to extend to the Association the courtesies of our line."

President Cahoon—At 4:30 this afternoon there will be two cars in front of the hotel here to take the Association over to the power house to go through it in a body. Arrangements have been made by our master of transportation for a special train to the Pan-American Exposition, leaving here at 2:30 P. M. sharp to-morrow and returning at 10:30 P. M., the train to run directly to the Exposition grounds. The fare will be 50 cents for the round trip. I gave this morning a list for the Nominating Committee, and I regret to say that one of the gentlemen, Mr. Lovejoy, is unable to serve, and I have therefore appointed Mr. Fairbanks of Worcester in his place. The next thing on the programme is the report of the Committee on Standard Candle-Power of Incandescent Lamps. Dr. Bell is unable to be present and delegated Mr. Ayer to read the report.

The report followed, and a discussion ensued in which Messrs. Ayer, Cahoon, Hubley and Marsh took part.

The meeting adjourned at 4:30 o'clock and the delegates in a body visited the power house and plant of the Niagara Falls Power Company.

WEDNESDAY—MORNING SESSION.

President Cahoon called the meeting to order at 10:45.

Secretary Porter read letters of regret from Governor Odell of New York and from W. Worth Bean of St. Joseph, Mich.

President Cahoon—Gentlemen, we will resume the work where we left off yesterday, when Prof. Goldsborough arose in regard to the discussion of Dr. Bell's report. I will call on Prof. Goldsborough at this time.

The subject of the standard candle power of incandescent lamps was further discussed at length.

The report of the Committee on Amendments to the Freight Classification was next taken up and discussed.

President Cahoon—The next matter on the programme this morning is a paper by Mr. H. W. Hillman, of Schenectady, N. Y. I will call on Mr. Hillman. While we are waiting for this paper to be distributed I will say that the Convention will go into executive session at 12:30 to-day. At that time there will be brought up a report of a Committee on Legislative Policy, and also the election of officers for the ensuing year. The trip to the Pan-American Exposition has been postponed until to-morrow afternoon on account of the rain to-day. Announcement will be made to-morrow morning as to what arrangements we can make about train for to-morrow, and whether a special train will be there to bring us back or not. Many of you will undoubtedly want to go directly from Buffalo to your homes. In that case you will not of course want to come back here.

Mr. H. W. Hillman then read a paper entitled "Arc Lighting at the Beginning of the Twentieth Century."

Mr. Walton—Mr. President, I would like to ask Mr. Hillman what methods he would suggest to overcome the so-called induction on telephone lines paralleling series alternating arc lighting lines. We have recently had such a case.

Mr. Hillman—Mr. Wagner has had particular interest in that matter and I think that he would explain and answer your questions a little better than I could. I would ask him if he would kindly do so.

Mr. Wagner—Referring to the telephone trouble on induction series alternating systems in general it is pretty hard to get rid of trouble if telephone circuits are grounded and not metallic circuits. I know that in one place 50 light transformers were installed running single circuits, and so long as a few of the telephone circuits were ground return there was considerable trouble. The minute they were changed over to metallic circuit the trouble practically disappeared. I think the instance Mr. Hillman refers to my being interested in occurred in Toledo. In Toledo there was a 100 light current transformer installed operating what we call single circuit, that is, about 8,000 volts instead of two multi-circuits of about 4,000 volts each. There was considerable trouble experienced on the telephone lines, though they were metallic, when the system was installed in this manner. We took the matter up to investigate, and arrived at a conclusion as to the exact cause. The cause might be either electrostatic or electrodynamic. To find out which of the two conditions existed we short circuited each lamp; at the switch and top of the lamp ran the normal current through the circuit, so that if the trouble was electro dynamic it should still exist. When this test was made, the telephone trouble entirely disappeared, showing that the trouble was not electro-dynamic and that it was electrostatic. I was talking with one of the gentlemen from Toledo this morning, and he tells me that since they have changed the circuit from a single circuit of 8,000 volts to a combination multi circuit of about 4,000 volts each the trouble has practically disappeared. It has entirely disappeared on the complete

metallic circuit and has been reduced about 75 per cent. on the ground return circuit. Theoretically other steps could be taken to entirely get rid of the trouble, but owing to the fact that grounds occur quite frequently on arc circuits and also that there is liable to be quite considerable trouble constantly, these other schemes are not really practicable, and the operation at a lower voltage seems to have taken care of the trouble.

The discussion was participated in by Messrs. Bechtel, Walker, Hillman, McCabe, and others.

President Cahoon—This afternoon we will take up the report of the Arc Lamp Committee; and also the discussion of the paper of Mr. Louis R. Wallis, on "The Foresee System of Charging," which was read at the meeting yesterday morning.

The meeting then adjourned to an executive session.

At the executive session the report of the Committee on Legislative Policy, Mr. Samuel Insull, chairman, was accepted, and the committee continued for another year.

The report of the Committee on Amendments to By-laws was also presented, and this committee was continued, the incoming President and First Vice-President being added to the committee.

The following named gentlemen were elected as officers for the ensuing year.

President—Henry L. Doherty, Denver, Col.
First Vice-President—Louis A. Ferguson, Chicago.

Second Vice-President Charles B. Hunt, London, Ont.

For members of the Executive Committee to serve during three Conventions—Charles L. Edgar, Boston, Mass.; D. B. Robinson, Seattle, Wash., and C. C. Howell, Knoxville, Tenn.

For members of the Executive Committee to serve during two Conventions—E. L. Bemis, New Orleans, La., and Dudley Farrand, Newark, N. J.

Mr. Frederic Nicholls, Toronto, Can., was elected an honorary member.

The meeting adjourned until 2:30 P. M.

WEDNESDAY—AFTERNOON SESSION.

The President called the meeting to order at 3 o'clock.

President Cahoon—The first thing that we will take up this afternoon is the discussion of Mr. Wallis' paper on the "Foresee System." You will recall that it was postponed from yesterday.

The discussion was opened by Mr. Slade and participated in by Messrs. Wallis, Walker, Price, Turner and others.

President Cahoon—I believe that we will consider the discussion closed on this subject, and take up the second progress report of the Committee for Investigating the Photometric Values of Arc Lamps.

Mr. C. P. Matthews, photometrist to the committee, read the report of the committee.

Mr. Hubley, Louisville, Ky.—This is a very interesting report and evidences the very good work performed by the committee. I wish to move that the Association accepts the report, tenders a vote of thanks to the committee for its good work, and that the committee be asked to continue this work until its completion.

The motion was carried.

President Cahoon—We will now take up the report of the Committee on Rules for Electric

cal Construction and Operation, Capt. William Brophy, chairman.

Capt. Brophy presented the report and also reported on the subject of the Grounding of the Neutral.

Both reports were received, after which the meeting adjourned.

THURSDAY—MORNING SESSION.

President Cahoon called the meeting to order at 10:30 o'clock, and announced that the first business would be the report of the Secretary and Treasurer.

Secretary Porter then presented a report, showing the following financial transactions during the year 1900:

Receipts for the year.....	\$7,776.50
Balance in bank.....	4,368.55

\$12,145.05

Disbursements.....	6,143.41
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Balance Jan. 1, 1901..... \$6,001.64

On motion the report of the Secretary was received.

President Cahoon announced that in honor of the National Electric Light Association the dome of the Electricity Building at the Pan-American Exposition would be illuminated to-night at 8:30 o'clock, which would be the first exhibition of the Nernst lamps, the illumination being done by the Westinghouse Electric & Manufacturing Company.

President Cahoon—The next order of business will be the reading of a paper by C. R. Van Trump of Wilmington, Del., on "A Station Load Diagram." In the absence of Mr. Van Trump we will ask Mr. McCabe to read the paper.

The paper was read.

President Cahoon—We have just received a telegram from Mr. Henry L. Doherty, the newly-elected President of the Association, as follows:

Denver, Col., May 22, 1901.

George F. Porter, Secretary National Electric Light Association.

Please convey to the Association my deep appreciation of the honor conferred upon me and assure them of my wish to make the Association large and prosperous.

HENRY L. DOHERTY.

President Cahoon—We will now take up the topic for discussion, namely, "Steam Heating from Central Stations."

The discussion that ensued was participated in by Messrs. Mannsell, Hubley, Wells and others.

Mr. Treadwell's paper on "Storage Batteries in Central Station Work" was read by Mr. T. C. Martin. The reading of the paper was followed by an interesting discussion participated in by Messrs. Sperry, Emory, Blizard and Donaldson.

President Cahoon—Are there any further remarks on this topic? There seems to be none.

I want to thank the gentlemen who assisted us in reading the papers of members who are absent, and say to them that we appreciate very much their assistance. We have completed the programme of the meeting, not in a hurry, but a little ahead of time, which is something unusual. When we compare our membership with that of the Gas Association, the Waterworks' Association, and various other of the national bodies, we find that their membership is well in advance of ours. I do not know why it is that electrical men hold back from joining this Association. One of the members remarked yesterday that perhaps it was due to the fact that in earlier years we had acquired a reputation for being somewhat boisterous

at our conventions; but like many things in the earlier days that is a thing of the past. The Association has come more and more each year to realize that these meetings are for the benefit of the members and that much can be learned by coming here and meeting other gentlemen in the same business and gaining knowledge from contact with each other.

I hope during the year to come that you gentlemen will each and every one make up his mind to bring a new member into the Association. We have made a good beginning. We want that work to go on and we want particularly to bring this Association up to the plane on which it should be. There are 1800 stations in the country that can afford to join this Association. In our present membership we have, roughly speaking, 10 per cent. of that number.

After a few further remarks by President Cahoon the Convention adjourned.

Sketch of the New President.

Mr. Henry L. Doherty, the newly-elected President of the National Electric Light Association, was born on May 15, 1870. He spent his early youth in Columbus, O., and started wage-earning by carrying papers, and at the age of 12 years obtained employment with the Columbus Gas Company. The superintendent of this company, and afterward its manager and president, was Emerson McMillin. Since Mr. Doherty first entered Mr. McMillin's service he has been (with one or two short exceptions) continuously connected with the McMillin interests, holding various positions of trust.

On account of his health Mr. Doherty moved to Madison, Wis., early in 1896 and became general manager of the Madison Gas & Electric Company, afterward becoming president. The plant was threatened with municipal opposition, which he successfully averted. His opposition to municipal ownership has brought him into prominence and stamped him as an active and effective worker. His exposition of the municipal-ownership question before the League of American Municipalities is still fresh in the memories of many.

Mr. Doherty has been foremost in furthering the objects and plans of the Northwestern Electrical Association and the National Electric Light Association. In January, 1899, he was elected President of the Northwestern Association, a position which he held with credit to himself and the society. His presidential address at last year's annual meeting of the Association attracted much attention. In this address he dwelt at length on methods of charging and equitable rates, a general subject upon which Mr. Doherty presented a paper to the National Electric Light Association in Chicago a year ago, and also one before the Northwestern Association last January. He has given this topic close and efficient study and has been putting his system into operation in different McMillin plants. He is now conducting a rate war in Denver, where he is acting president of the Denver Gas & Electric Company. Although he devotes considerable of his time to the Denver plant and also looks after the Madison and other plants as Mr. McMillin's assistant, Mr. Doherty spends much of his time in New York City.

Mr. Doherty's connection with the National Electric Light Association has been an active one from the start. At the time of his election to the Presidency he was chairman of the executive committee. The new President is also a member of the American Institute of Electrical Engineers and of several other associations.

THE TRANSMISSION OF CURRENT AT HIGH POTENTIAL IN NEW YORK CITY*

BY CALVIN W. RICE.

In America the most acceptable system in cities is the low-tension Edison, 220 volt, direct current, three wire system. This system is the one best adapted to miscellaneous lighting, power and industrial work. The value of a power business in connection with lighting is recognized by all, and as there are in the market a score or more makes of direct current motors, each manufacturer is therefore an agent of the light and power company.

The system requires sub-stations at frequent intervals, determined by the relative cost of transmission system loss in same and station equipment. As steam stations they have less economy than central stations, and are sometimes placed where they are somewhat objectionable to residents.

The perfection of the rotary converter has been a great factor in the ability to meet the desire to generate power in a large central station located with advantage to coal and water.

With the revolving field generator came the ability to generate current directly at high potential. It was thus rendered possible to do away with step-up transformers for all ordinary potentials and transmissions.

Accompanying this advance was the development of switching and safety devices for high potentials.

Thus we have in outline a perfected system, namely, the generation of current in one large station favorably located, its transmission to sub-stations, and local distribution from each such center.

In New York, the above system is also adopted for pure power, that is, railway work, as well as for combined lighting and power.

The East River side of New York has been selected for the sites of the four power stations now building. These are located at 39th street, New York Gas and Electric Light, Heat and Power Company; 75th street, Manhattan Elevated Railroad; 96th street, Metropolitan Street Railway, and at the northern limits of Manhattan Island, near Spuyten Duyvil, for the Third Avenue Railroad station. In all of these stations large direct connected units are employed, generating the transmission voltage.

The generators in all are of the three-phase, revolving field type, twenty-five cycles, seventy-five revolutions.

The Third Avenue station, the Metropolitan, and the New York Gas generate at 6,600 and the Manhattan at 11,000 volts.

The transmission in each case will be in three-conductor cable laid in subways, three inch duct in three systems, and three and one-half inch in the case of the Manhattan. In each system, also, the transmissions will be to sub-stations with step-down transformers and rotary converters.

The potential of the outers of the Edison three-wire system is 270 volts nominal, and for the railway work 550 to 600 volts.

The frequency of twenty-five cycles admits of satisfactory design in the rotary converter, which is one of the essentials of the system. Low frequency is also preferable, as all the generators are direct-connected to Corliss type engines. On the other hand, it does not admit of successful lighting in either incandes-

cent or arc, with the possible exception of the street series incandescent lighting.

The above shows the points in common to all stations. We will, however, now speak particularly of the largest station, that of the New York Gas Company.

Before going to the description of the central station—which, by the way, will have the largest capacity of any in the world, and more than the completed twenty-wheel plant of the Cataract Power Company at Niagara—it is well to state that the whole system now being installed was planned several years ago.

As early as 1896, the Edison Company installed motor generators in a cellar, at the corner of Fifth avenue and 72d street. These were 240 kilowatt synchronous two-phase motors, direct-connected at either end to 100 kilowatt, 135 volt Edison bi-polar generators. This was the first step in New York city in the development of the present sub-station employing rotary converters.

In 1898, two-phase, 200 kilowatt rotary converters were installed in the 83d street station, and later, in that same year, three-phase rotary converters were placed in the Duane street and 39th street stations, so that energy could be transferred at 6,600 volts alternating between the districts.

The efficiency transmitting 1,000 kilowatts, the full load of a rotary, from the direct current switchboard at one generating station, including all transformers and line loss, to the direct current switchboard at the receiving station is 81 per cent. This shows the practical economy of a flexible system.

By this means the Duane street station, which is situated at the southerly end of the island, can follow the load as it moves uptown with the people as they go from business to their homes, and then to the stores and theaters. A very high load factor is thus obtained throughout the year.

The waterside station occupies the block between 38th and 39th streets on First avenue down to the East River. It is situated at nearly the geographical center of distribution.

The area covered measures 272 feet by 197 feet, so that with its ultimate capacity of 125,000 horse power they will have a horse power for every 0.43 square foot, and in this respect will have not only the largest station, but also the most economical of space.

The equipment will be sixteen direct connected units. The engines will be 5,200 horse power at most economical cut-off, and will have a maximum capacity of 8,000 horse power. They will be vertical, three-cylinder, compound-condensing, taking steam at from 175 to 200 pounds.

The generators will be 3,500 and 4,500 kilowatts at 6,600 volts, and will have a regulation of 8 per cent., and on short circuit will give about three times full-load current. These characteristics of regulation and high self-induction insure smooth running and good synchronizing ability.

Steam will be supplied from fifty-six watertube boilers, 650 horse power each. Each boiler will be equipped with mechanical stokers. The boilers will occupy two floors of the boiler house; the coal bunker, with a storage capacity of approximately 10,000 tons, being located immediately above the boilers.

There will be four steel stacks, about 200 feet high and nineteen feet internal diameter. These will be supplemented by fan blowers for forced draught.

Condensing water for the engines will be supplied from East River through a main exterior intake tunnel ten feet in diameter. This tunnel will be divided at the building line into two eight-foot tunnels, which will run under the two rows of engines. The discharge tunnel will be placed just above the intake tunnel.

The switchboard will be distributed in galleries.

Single conductor cables will be led out from ducts in the foundations of the generators and will go to electrically-operated oil switches situated on the first gallery. From there cables will go to the selector air switches on the top gallery. These selector switches will be operated by hand and are to be used as a safety in an emergency when the oil switch fails to act.

As there will be sixteen units, so there will be sixteen banks of oil switches. In between each group of three oil switches, one for each phase, will be the transformers for the instruments, voltmeters and ammeters.

On the top gallery the grouping of the switchboards will be such that it will be physically possible for one man to control the entire situation. Of course, two men will be on duty at all times, as a matter of practical operation, but it is interesting to note that the switches will be so grouped with their instruments that one man can handle the situation.

The governing control of each engine will be manipulated also from this point, and one will be able to vary the cut-off from 20 per cent. to 45 per cent., or the speed 2½ per cent. each way from normal.

The cables for the transmission are lead covered, three-conductor, 250,000 circular mils. At first only rubber was used, but this last season paper was tried, so that now it is about equally divided, there being about twenty-five miles of each.

In the rubber cable each conductor is insulated with six thirty-seconds of an inch rubber insulating wall. The three conductors are then laid with jute and made into a cable of circular section and another jacket of rubber put on, four thirty-seconds of an inch in thickness. The rubber compound is 30 per cent. pure Para. The lead is one-eighth inch thick, three per cent. tin, but with no outside coating of tin. This gives a cable two and five-eighths inches outside diameter, and the experience from laying fifty miles of cable would indicate that this is the largest practical cable that can be installed in a commercial three inch duct.

The insulation resistance required on the rubber cable was 1,000 megohms per mile, measured either between conductors or between conductor and lead. The completed cable was tested to 20,000 volts in the ducts.

The paper cable was similar, but with two-thirty-seconds inch more insulation in the outer jacket, making twelve thirty-seconds inch insulating wall in all directions. Insulation resistance required on this was 400 megohms per mile.

The paper cable measured two and eleven-sixteenths inches outside diameter, and although it has all been installed, yet it was done with difficulty; and one would not advise attempting it again, as it was a great mechanical strain on the cable. The natural question in the minds of many is, which is better? It is proper to say that satisfaction has been obtained with both.

The number of conductors at present in-

*Paper read before the National Electric Light Association at its Twenty-fourth Convention held at Niagara Falls, N. Y., May 21-23, 1901.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 29.

CONDENSERS AND THE MEASUREMENTS OF THEIR CAPACITY.

stalled is such that at no point in the system is there more than 5 per cent. actual drop in any feeder. As 40,000 feet is the longest, it happens that the 5 per cent. limit on drop at that distance is reached at the maximum ampere capacity of the cable, which is about 225 amperes, or a little over 2,250 kilowatts. This gives a little over two watts per duct foot, which is also a limit in subway work. Were there a larger number of ducts in one trench, even two watts per duct foot could not be allowed.

Cables are allowed sufficient slack to be carefully racked on the sides of the manholes. The outside of the cables is wrapped with asbestos and steel tape so that, in the event of one cable failing, it will not melt the lead and insulation off its neighboring cables. This covering complete costs about five dollars per cable per manhole.

At the substations the cables go to marble switchboards, each circuit being separated by septums from its neighbor. Each circuit is provided with safety devices. The switchboard cables lead to the air-blast transformers, which are connected in to give a double delta or six-phase relation on the secondary.

The rotaries are six-phase, as it is agreed that their action is better, less armature heating, and the amperage led into each collector ring is reduced.

Between the statics and the rotary are the induction regulators. These regulators have about 13 per cent. of the capacity of the rotary, as a potential regulation of thirty volts is required either way of normal, which is 270.

Only two sizes of rotaries are used, 500 kilowatt and 1,000 kilowatt.

An interesting feature of the entire system is that all translating devices are in multiple; that is, all rotaries, in whatever location, are in multiple on the alternating current side with the generators at the central station and with every other rotary in the substation. On the direct current side every rotary is in multiple with every other rotary, direct current generator or storage battery.

By means of the field rheostat all rotaries are operated at minimum input, which gives a power factor of one to the system.

Floating on the system in almost all of the rotary and substations are storage batteries. The most common unit is one of 150 cells, having a capacity of 2,000 amperes discharge for one hour.

The completeness of the system is shown by the uniformity of potential and continuity of service. It is considerably over ten years since there has been an interruption of service.

A New Process for Making Hydrogen.

Richard Guenther, the United States Consul General at Frankfurt, Germany, writes to the State Department that German papers report that H. Houbon, an Englishman, has invented a process for making pure hydrogen from acetylene. He condenses acetylene in a Cailet steel bomb up to five atmospheres, and ignites it by means of electricity. Hydrogen and carbon are formed; the latter precipitates in form of fine soot. The process is, it is claimed, without danger and makes it possible to generate hydrogen on a large scale very cheaply. This invention may mean much for balloon technique, the Consul General thinks, as the present methods of making hydrogen are expensive.

The condenser has not received a great amount of popularity in the electrical field until within the last few years, although it has been used in testing appliances and on X-ray coils; however, the great field of its usefulness has not developed until the recent modernized systems of telephony have been adopted, and in that work it has become very popular and its scope of practical usefulness considerably broadened. Condensers depend entirely for their action upon the law of electrical capacity, and the function performed by them in practical work is directly opposite to that of a retardation coil. The retardation coil permits of the free passage of a direct and even flow of current, but in it the law of self-induction impedes the flow of an alternating or disturbed current.

The flow of a direct current is entirely stopped by placing a condenser in its circuit, but however its action when placed in an alternating circuit is such as to produce the same practical effect as if it were not in the circuit.

Every electrical conductor has capacity to a more or less degree, that is to say, it will hold a certain magnitude of current as a charge, and on this law is based the action of the condenser.

A condenser consists of two electrical conductors separated by an insulation known as the dielectric. The plates, coatings or conductors may be made of any conducting material and the dielectric of any insulating material; however in their construction the materials are used which are known to give the best effect.

When an insulated wire is laid in the earth or is strung overhead it becomes one plate of a condenser because it has capacity. The other plate of the condenser is the earth and the dielectric is the insulation of the wire or the air which is between it and the earth.

The capacity of a wire has a great deal of effect on its usefulness in telephone or alternating current work, and that is the reason why telephone transmission is not nearly so good through an underground cable as over an equal length of overhead wires. The underground wire has a great deal more capacity than overhead lines, as the capacity depends directly on the area of the conductors or plates, their closeness together and the inductive capacity of the dielectric. Insulating materials have very different values as dielectrics and the inductive action is very much stronger through some material than through others, air being the insulation through which it is the least active.

Commercial condensers are made with sheets of tin-foil for the coatings, separated by thin paraffin paper and then rolled and placed in a suitable box or covering. The sheets of tin-foil are separately connected to terminals mounted on the outside of the case. The combined capacities of the coatings are the rated total capacity of the condenser. By charging a condenser with a certain quantity of elec-

tricity means that a positive charge of a certain quantity is placed on one plate and an equal negative charge on the other.

To illustrate the electrical phenomena of a condenser we will compare its action to that of water in two vessels which are connected together by a tube, as described in Fig. 1.

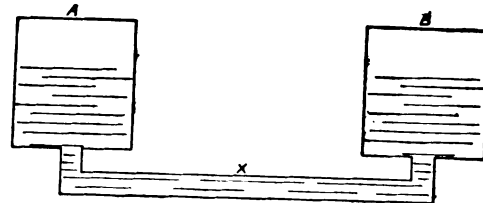


FIG. 1.

Suppose A B to represent two vessels connected together by a tube filled with water as represented by the shaded line. Suppose a force pump be placed at point X and by it the water be forced up into the vessel A. The amount of water forced will be limited by the capacity of the vessel and a vacancy in the vessel B will be created equal to the amount of space filled in A. Now immediately the force be taken away and a free flow permitted back through the tube the water will flow back into B until an equal level in each vessel is reached. This clearly illustrates the action of a condenser to an electric current. If a direct flow of current be applied to the terminals, the plates will be charged to an extent depending upon their capacity and will not discharge or find their equal electrical level until a circuit is provided for the positive to discharge to the negative, which will not occur so long as the pressure of the direct current is kept applied in one direction in the circuit. So you see no effect could be secured by connecting a battery or direct current to a condenser except to charge the plates, which would remain inactive until allowed to discharge by making a circuit between the plates. To illustrate this, connect the two poles of a battery to a condenser, then disconnect the battery and go across the two terminals of the condenser with a telephone receiver and the flow of the current from the positive plate to the negative plate will be distinctly heard.

The action of an alternating current on a condenser, however, is much different, in the fact that an electrical disturbance is maintained in the circuit. The current alternately charges each of the plates of the condenser, which discharge back through the circuit when the current is changing its polarity and has reached the no potential point, so that an alternating electrical disturbance may be maintained equal to and governed by the capacity of the condenser to an electrical charge.

The practical application then is that a condenser will act as an "open" when connected in a battery or direct current circuit, while if connected in a circuit with an alternating or disturbed flow of current the amount of electrical action which can be maintained in the circuit is equal to the capacity of the condenser.

During the charge of a condenser the electrical pressure of one plate rises and the electrical pressure of the other falls just as the water in the two vessels.

In measuring the capacity of a condenser it is said that it has the capacity of one farad when the difference of the electrical pressure of the plates is raised one volt by the charge of one coulomb. For practical pur-

poses this measurement is divided into microfarads. A microfarad is the one-millionth part of a farad and has now become the common unit in which capacities are measured.

Several of the uses to which condensers are put are as follows: By placing a condenser in series with the ringing coils in a telephone which is used in common battery work it provides an open circuit for the direct current when the telephone is not in use and yet permits of the bell being rung with alternating magneto current from the central office. It is also connected around telephone transmitters to sharpen the induced current waves in an induction coil. If an excessive arc is produced at the contact of a circuit breaker or on the make and break contact of a vibrating bell it may be entirely dispensed with by connecting a condenser of sufficient capacity across the point of arc so that it will take up the arc of the break as a charge into the plates, which will discharge again immediately the vibrator makes contact.

This application is found very valuable in the "break" contact on X-ray coils when the sparking is very damaging on account of self-induction of the coil.

They are also used in testing appliances, which are used for measuring the capacity of cables and aerial wires.

Article No. 30 will be entitled "Points for Review."

THE HORSE POWER OF STEAM ENGINES.

BY W. H. WAKEMAN.

One of my numerous correspondents wants to know how to determine the piston speed of an engine, as he finds that he must settle this question before he can figure out the power his engines are developing. It is an easy matter to find rules for this, in which the area of piston, mean effective pressure and piston speed are to be multiplied together, but they do not tell how to determine the piston speed.

This man is not a beginner, so far as running an engine is concerned, for he has been in charge of plants for years, and at present is caring for one of a respectable size, but this question is not clear to him, and while thinking the matter over I have wondered how many others were not clear on the same subject. To those who already know how to solve this problem it seems very simple, but you must remember that there was a time, and it may not have been a very long time ago, either, when you were not so well posted as you are now, so do not be too hasty in saying that such an article as this is not called for, because it is quite possible that you are mistaken.

In the case of an ordinary engine taking steam on one end of the cylinder and then on the other, it is proper to take the piston speed for both strokes and for the number of revolutions made in one minute, for the horse power of every engine is calculated on the basis of what it does in one minute of time. For illustration, take the case of a 20 x 42 inch engine making 85 revolutions per minute. As it starts from the center and travels over to the other center it goes 42 inches or 3½ feet. As the piston comes to a full stop and then re-

verses its motion, it comes back to the place from which it started, making another stroke of 3½ feet, and this completes one revolution. It has now traveled 7 feet, and as it does this 85 times in each minute, we multiply 85 by 7 and find that the speed is 595 feet.

With a 16 x 20 inch engine running 150 revolutions per minute, the calculation is as follows: The travel is 40 inches, which is 3½ feet for each revolution, and $150 \times 3\frac{1}{2} = 500$ feet per minute.

I find that engineers do not always understand how to calculate the piston speed of a single acting engine. It must be plain to every one that when the steam acts on one end of the cylinder only, the engine cannot develop as much power as it will when the steam is admitted to both ends, therefore it is customary and proper to take one-half of the full piston speed, because in that way we calculate on the travel of the piston while the steam is acting on it.

While several engineers were discussing this point one evening, one of them claimed that the piston traveled just as far on a single acting engine as it did on any other kind, therefore he did not understand the philosophy of taking only half of it.

We might take one-half of the area, or one-half of the mean effective pressure, or divide by one-half of 33,000, or figure it up the same as we would for a double acting engine and divide the final result by 2 for an answer, but somebody would be found who would object to each one of these plans and claim that the philosophy of it was not sound—therefore we might as well stick to the plan of taking one-half of the piston speed.

For illustration, if the 16 x 20 inch engine was single acting we would calculate its power in the usual way, except that the piston speed would be 250 feet.

Another point that I know has proved to be a stumbling block to some, is the matter of deducting the area of piston rod from the surface of the piston in order to get the net area on which the steam acts. If we take the case of a large horizontal engine having a piston rod that is continued through the cylinder head on the head end in order that it may be supported at both ends of the rod, it is proper to deduct the full area of the rod from the piston, but where the rod covers a space on one side only the full area must not be taken out. There are at least two ways of doing it, either one of which will give a correct result, but one is much more complicated than the other. Taking the 16 x 20 inch engine to illustrate this, and calling the diameter of rod 2½ inches, the area of which is nearly 5 square inches, we might calculate the area of the piston to be 201 square inches for 250 feet of piston speed, and take out the 5 square inches, leaving it 196 for the other 250 feet and add the two together. Then $201 \times 250 = 50,250$ and $196 \times 250 = 49,000$. Adding these together the sum is 99,250.

The foregoing is one way to do it, and the following is the other: Dividing the area of rod by 2 gives 2.5 square inches to be subtracted from the full surface. $201 - 2.5 = 198.5$ and $198.5 \times 500 = 99,250$ as before.

The above illustration makes it plain that the plan of subtracting one-half the area of piston rod from the area of piston is to be preferred on account of its simplicity.

Another thing that will bear explanation is that it is not correct to use the average pres-

sure on the piston, as some authors tell us very plainly to do.

When the piston of an engine starts from the head end and travels through a stroke the pressure on it varies at different points, so that if we want the average we must measure it at these different places, add the results together and divide by the number of measurements. The quotient will be the average pressure for that stroke, but all of this is not available for driving the piston and transmitting power to the crank, because there is some pressure on the other side of the piston at the same time which acts to oppose the advance of it, and this we call back pressure.

This may not be the same at all points in the stroke, therefore we must get the average of it in the same way that we did for the forward pressure. When we subtract the average back pressure from the average forward pressure, the remainder is the mean effective pressure, and this is available for driving the piston, therefore it is proper to use it as a factor when determining the indicated horse power.

A NEW THEORY OF WIRELESS TELEGRAPHY.

M. Rudolf Blochmann, in the "Revue Générale des Sciences," February 15th, makes an important contribution to the theory of wireless telegraphy, which throws a great deal of light on certain phenomena, for which, hitherto, no satisfactory explanation has been given. For instance, why can wireless telegrams be transmitted to a greater distance over sea than over land, and why are horizontal antennæ less effective than vertical antennæ?

These questions, according to M. Blochmann, are completely answered by taking into consideration the electrical condition of the medium through which the electric waves are transmitted. This medium is the atmosphere near the earth's surface, and the author points out, what has usually been forgotten, that this medium is not in a state of electrical equilibrium, but is subjected to a severe electric strain by the permanent electrostatic charge in the earth. The presence of this charge gives rise to a considerable electrostatic strain in the atmosphere near the earth's surface, which strain may be represented by a series of equipotential surfaces enveloping the earth, as the layers of a bulb surround the central core. At sea these equipotential surfaces are regular and parallel to the earth's surface, but on land they follow such inequalities as high buildings, cliffs, mountains, etc., and are consequently bent and twisted like the geological strata of an alpine region.

The vertical antenna of a transmitting apparatus pierces these equipotential surfaces in a normal direction, and the disturbances produced by the intermittent charges of electricity sent into the wire have their greatest effect in an axial direction. Violent oscillations in the equipotential surfaces over the end of the wire are produced by the periodic variations of potential at the end of the wire, much in the same way as waves are produced on the surface of a pond by dropping a stone into it. As the waves in the pond spread out over the level surface of the water, so the electric waves spread out in every direction along the equipotential surface, following all the irregularities of its surface.

Electric waves used in wireless telegraphy do not, according to this theory, propagate themselves in straight lines, like waves of light, or very short Hertzian waves. Hence we have an explanation of the well known fact that wireless messages can be transmitted between antennæ whose tops are, owing to the curvature of the earth, invisible from one another. Irregularities in the equipotential surfaces, as might be imagined, obstruct, to a certain extent, the passage of electric waves over them, and, as a consequence, the distance to which messages can be transmitted on land is not so great as at sea. Experiments made at Mt. Blanc have shown that mountainous regions are unfavorable to wireless telegraphy.

A horizontal antenna is comparatively ineffective because the maximum potential disturbances at its terminals are not normal to the equipotential surfaces. Another important deduction which may be made from Blochmann's ingenious theory is that the antennæ of wireless telegraphy apparatus set up on the edge of a cliff or on a steep hillside should not be vertical, but nearly perpendicular to the slope where they are fixed.

In a country with an irregular surface, the ends of the antennæ of the transmitter and of the receiver, though of the same length, may not pierce the same equipotential surface, and if so this will detract considerably from the efficiency of the transmission. The wireless telegraph engineer in seeking to fulfill this requirement of theory may have to make the antennæ of different instruments of unequal length, or fix them at a certain angle to the vertical.

M. Blochmann does not attempt to explain why long antennæ are more effective than short antennæ, but this appears to be completely explained by the theory of Prof. Slaby, who has shown that the potential oscillations in a wire connected to earth are like the vibrations in an elastic rod fixed at one end, and therefore greater at the free end the longer the wire is. By combining the contributions of Slaby and Blochmann, we arrive at a theory of wireless telegraphy, which, if not complete in every detail, appears to be correct in the main, and should be of the greatest value to those engaged in the erection and working of wireless telegraph stations. For instance, Blochmann's theory would lead us to predict that the presence of highly electrified clouds between a receiver and a transmitter would render the transmission of messages less effective by the distortion they would produce in the equipotential surfaces; whether or not this has been observed in practice we do not know.—"Electrical Review," London.

New Departure for a Railroad.

North and South Carolina railroads are at loggerheads over the orange traffic. The Great Northern, which has been carrying the fruit eastward from Seattle, Wash., getting it from the latter place by means of boats from the South, is handicapped by the Southern roads refusing to carry the luscious spheres to the coast. The Great Northern threatens to bring its rivals to terms by putting on a line of freight automobiles from the orange districts to the coast during the harvest season. It is the first instance on record where a powerful railroad corporation seeks to obtain business through the medium of the self-propelled vehicle.

MR. EDISON'S LATEST INVENTION.

(From the New York Morning Journal, May 27.)

Thomas A. Edison, the Wizard of Electricity, has discovered how to make "Portland cement" at an extremely small cost.

This statement, at first thought, seems to be comparatively unimportant. Yet Edison knows the immense value of his discovery. He expects that his cement will drive out quarried stone and brick as building materials.

And "the Wizard" foresees as the result of his discovery that it will cost very little to build houses, and that, therefore, rents will be very low; he foresees "small palaces" renting for \$10 a month; he foresees that when houses built of his concrete and steel frames are erected the fire insurance companies will go out of business.

With cement so cheap a house will be "poured," not builded. And the pouring of the house will occupy but a few days. The house will be habitable when the concrete solidifies.

The secret of making Portland cement at a cost so small has only lately been discovered by Mr. Edison. For several years he has been working on the cement problem and the problem of making cheap and practical storage batteries. Both inventions have now been perfected.

The inventor says that cement, combined with steel, will be the building material of the future, and says:

"My impression is that the time will come when each contractor will have standard forms of houses, twenty or thirty varieties. The forms will be made of wood, and a contractor, using one of the standard shapes, will simply go out and 'pour' a house.

"There will probably be hundreds of designs. The contractors will put up their concrete mixer, and have their beams and forms ready. They will pour the form for the first story, and so on.

"To do that all they will require will be common labor—a few men and one boss. That it what I think will be done eventually. And such a house can be made very cheaply. It seems to me that there will not be much use for carpenters then. There will be cabinet-makers to be sure. Why even the floors and stairs will be made of concrete."

Mr. Edison was asked if Portland cement would be cheap enough for general use.

"Yes, I think so," he said, "when the price of cement gets to be \$1 a barrel or \$5 a ton, and people know they can get it for that, there will be enormous quantities of it used."

The inventor said that one part of cement, three parts of sand and five parts of broken stone would be the mixture for concrete, and that broken stone was better than broken brick.

Mr. Edison, in reply to a question as to the thickness of walls in the ordinary workman's house, said:

"The bottom course ought to be of Portland cement, 12 inches, up to the first story, and 8 inches above the first story. The roofs will be of cement also."

To Push Edison Invention.

The Edison Storage Battery Company, capitalized at \$1,000,000, was incorporated Saturday to manufacture Thomas A. Edison's latest invention, the light storage battery.

The incorporation papers were filed in the County Clerk's office in Newark, N. J.

The incorporators named in the papers are Herman E. Dick, of Chicago, and Walter F. Mallory and Walter E. Gilmore, of Orange. Howard W. Hayes is counsel for the company.

It is Mr. Edison's plan to erect in Newark a plant for the manufacture of the new batteries which he believes will revolutionize electric propulsion. Twenty acres of land will be bought and the buildings will be especially adapted to the development of the Wizard's latest invention. Employment will be given to 1,000 men.

LONDON NOTES.

(From our London Correspondent.)

Royal Institution.

Professor Jagadis Chunder Bose, of India, whose discourses before the British Association and Royal Society in London have always been so enthusiastically received, has just been lecturing before the Royal Institution in London on "Response of Inorganic Matter to Mechanical and Electrical Stimulus."

Behr's "Lightning Express" Railway.

For some days past a Parliamentary Committee has been listening to a great deal of technical and general evidence for and against the Manchester-Liverpool mono-rail system or Behr's system. As an instance of the obstinacy of opponents we may cite the remark of one who said that an arrangement for bolting passengers down was necessary to insure safety.

Royal Society Conversazione.

Among the more interesting electrical exhibits at this conversazione were the Poulsen telegraphone, and Mr. W. Duddell's musical arc. Mr. Wimshurst showed photographs illustrating the properties of light emitted by Roentgen tubes, and Mr. Mackenzie Davidson showed stereoscopic transparencies of electric discharges.

Underground Railroads and Vibration.

It will be recalled that last year a good deal was being said about vibration due to the operation of the Central London deep level electric road, and a Parliamentary Committee was appointed to thoroughly investigate the whole subject, so that the exact effects might be known before anything further was done in the construction of the many other lines then projected. The committee has now drawn up a report in which it states that from personal inspection its members are satisfied that "serious vibration was felt in many of the houses on the course of the railway." Self-recording instruments led to the opinion that vibration arose from the large proportion of weight of locomotives not borne on springs and from want of rigidity in the rails. A new type of locomotive had been ordered by the committee from America, and further experiments would be made, and engineers were endeavoring to overcome the difficulties which had hitherto prevented stiffer rails being used. When the results of further experiments were known the committee would give a more definite opinion as to the steps which should be taken on the Central London Railway to reduce vibration, and what features should be introduced on new lines. Meantime from observations made and information obtained, the committee was of

opinion that under proper conditions vibration could be prevented, but abstained from making definite recommendations until these experiments were completed.

Electric Power Supply in London.

The large number of electric power distribution schemes now being projected have led the London County Council to call a conference of all municipal authorities in the London area to discuss whether it is desirable for the Council to secure consent to enable it to supply power in bulk at cheap rates to any of the authorities who may desire to take it instead of putting down new stations or extending the existing ones.

Electricity Supply at Calcutta.

The electric lighting station of the Calcutta Electric Supply Corporation is doing a brisk business and plans are already drawing up for increasing the plant by adding two 1,100 hp. Crompton-Belliss steam generators. A new Alipore station is to be erected on the banks of Tollys Nullah, and it will contain two 60 hp. and two 300 hp. steam dynamos. There are 17 miles of overhead mains and 9 miles of underground. There is a great demand for electric fans and for driving power for them; in fact the Corporation supplies more energy for these purposes than for lighting; 1,100 more fans have just been sent out on the company's own account, and by the end of this season as many as 5,000 will be in use. The units supplied for fan driving alone last year amounted to about 213,000, the lighting supply being 199,000. This year so far the business shows an increase of 130 per cent.

CANADIAN NOTES.

(From our Ottawa Correspondent.)

The Hydraulic Power Company of Peterboro, Ont., is about to build a dam and develop electric power which is to be supplied to the American Cereal Company and other industrial concerns in the vicinity.

The Electric Street Railway at Moncton, New Brunswick, is announced to have been sold to an American syndicate, and it is said that the rails will be taken up and the plant removed.

Prof. R. B. Owens of the electrical department of McGill University, Montreal, and Mr. J. B. Ingersoll, E. E., chief inspector of rolling stock for the Montreal Electric Street Railway, have just completed some interesting experiments with a new roller bearing, the Wright roller bearing journal, designed for all kinds of vehicles, from railway coaches to vehicles for ordinary street traffic. Two street cars on a certain route in the city of Montreal were used, and the object was to show how much electric power could be saved by the new device when contrasted with the journals at present in use in the street railway cars. These cars are at present equipped with the standard journal bearing, and the journey of 10 6-10th miles, covered with a large number of street corner stops, consumed 15,000 watts, or 20.37 horse power, while the Wright roller bearing journal consumed 10,120 watts or 13.43 horse power. The two cars were alike, and were loaded to represent 42 passengers. The testing instruments used were Thomson-Houston recording wattmeters.

For the first time in the province of Ontario, the Appellate Court has held that the rolling

stock of an electric street railway is realty, and that electric cars cannot be seized by creditors having judgments against the company which has given a mortgage upon its property. This important decision, affecting as it does all the electric street railway companies in Ontario, has just been handed down by the Ontario Court of Appeal. By this decision the Bank of Montreal loses, and the bondholders of the Cornwall, Ont., Electric Street Railway Company win in a hard and long-fought battle on their respective claims. The dry law of it is that a moving electric car, passing over the land, is a fixture and passes with the land. Detached, it is regarded as useless, and so is not a "chattel," and cannot be seized as such to satisfy a judgment. The full Court of Appeal for the province has concurred in this view, and the bank will have to resort to a higher court, as it probably will.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended May 22:

Antwerp, 102 packages, \$7,680; Argentine Republic, 201 packages, \$7,228; Athens, 9 packages, \$268; Australia, 5 packages, \$69; Brazil, 143 packages, \$1,633; Bremen, 1 case, \$105; British East Indies, 84 packages, \$12,633; British Guiana, 17 packages, \$1,261; British West Indies, 2 packages, \$231; 1 case, \$11; Brussels, 1 case, \$5; Budapest, 4 packages, \$203; Central America, 12 cases, \$237; Chili, 15 cases, \$174; Christiana, 4 cases, \$20; Copenhagen, 1 case, \$25; Cuba, 124 cases, \$4,020; Dundee, 1 package, \$4; Dutch East Indies, 4 packages, \$51; Ecuador, 10 cases, \$310; French Possessions in Africa, 2 cases, \$20; Genoa, 106 cases, \$8,147; Gibraltar, 2 cases, \$40; Glasgow, 36 packages, \$5,000; 19 packages electrical cable, \$4,750; Hamburg, 39 cases, \$1,286; Havre, 75 packages, \$2,575; Japan, 223 packages, \$17,457; 136 cases, \$25,613; Leeds, 4 packages, \$710; Lisbon, 87 packages, \$9,977; 6 packages electrical cars, \$35,924; Liverpool, 146 packages, \$12,756; London, 302 packages, \$28,230; 24 rolls electrical cable, \$4,504; Manchester, 105 packages, \$15,432; Marseilles, 6 cases, \$500; Mexico, 7 cases, \$1,183; Naples, 2 cases, \$77; Perm, 7 packages, \$270; Philippines, 51 packages, \$1,001; Preston, 1 package, \$30; Siam, 63 packages, \$3,009; Southampton, 3 packages, \$300; 6 cases, \$1,166; Stockholm, 7 packages, \$800; Uruguay, 12 cases, \$238; U. S. Colombia, 13 packages, \$569; Venezuela, 33 packages, \$460.

INCORPORATIONS.

The Electric Dispatch Company, Detroit, Mich.—to do a freight and express carrier business. Capital stock, \$100,000.

The Kay Electric Dynamo & Motor Company, Toronto, Ont. Capital stock, \$40,000. Provisional directors: Thomas L. Kay, William E. Mulholland and Orlando Kellond.

The Iroquois Electric Light & Power Company, Ltd., Toronto, Ont. Capital stock, \$10,000.

The Kennebunkport Light & Power Company, Sanford, Me.—to supply gas or electricity for lighting and heating. Capital stock, \$10,000. Officers: President, E. P. Libbey; treasurer, A. J. Robinson, both of Sanford.

The Hetyl Hydro-Carbon Heat & Power Company of Philadelphia, Wilmington, Del. Capital stock, \$100,000.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED MAY 21, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

674,458. Closed-Conduit System of Electric Railways. Frederick C. Eamond, Brooklyn, N. Y., assignor to the Es-

mond Electric Traction Company of West Virginia. Filed Nov. 21, 1899.

674,467. Line Conductor for Electric Railways. Alexander Palmros, Fairmount, W. Va., assignor to the Jeffrey Manufacturing Company, Columbus, O. Filed Jan. 12, 1901.

674,523. Automatic Signal for Electric Railways. Charles H. Storm, Waterloo, Ia., assignor to himself, Ralph L. Storm, Edwin M. Storm and Charles S. Chase, same place. Filed Aug. 28, 1900.

674,589. Trolley. Joseph Trickett, Reading, Pa. Filed Nov. 10, 1900.

674,617. Trolley-Wire Clip. James W. Perry, Philadelphia, Pa., assignor to the H. W. Johns Manufacturing Company of New Jersey. Filed April 6, 1901.

674,656. Hanger-Clamp for Trolley-Wires. George H. Riecke, Cincinnati, O., assignor, by direct and mesne assignments, to Samuel K. Druce, John Asa Hosbrook and Daniel S. Hosbrook, Madeira, O. Filed Dec. 28, 1900.

674,657. Trolley-Wire Supporting and Connecting Device. George H. Riecke, Cincinnati, O., assignor to Samuel K. Druce, John Asa Hosbrook and Daniel S. Hosbrook, Madeira, O. Filed March 21, 1901.

674,660. Electric Signaling Device. Conrad F. Wilder, Chicago, Ill., assignor of one-third to Henry Kamm, same place. Filed Nov. 7, 1900.

674,740. Trolley. Alexander Palmros, Columbus, O., assignor to Joseph A. Jeffrey, same place. Filed Oct. 6, 1899.

ELECTRIC LIGHTS AND APPLIANCES.

674,643. Electric-Arc Lamp. Royal E. Ball, New York City, assignor to the Ball Electric Company, Yonkers, N. Y. Filed April 11, 1900.

674,770. Electric Lamp. Cloice B. Hull, Chicago, Ill. Filed Jan. 30, 1901.

ELECTRICAL MACHINERY AND APPARATUS.

674,505. Armature-Core. Henry E. Heath, Windsor, Conn., assignor to the Eddy Electric Manufacturing Company, same place. Filed Oct. 4, 1900.

674,676. Apparatus for Generating and Supplying Motive Power to Motors. Louis E. H. Fievet, Paris, France. Filed March 20, 1899.

674,796. Machine for Forming Insulating-Bushings. Henry T. Palste, Philadelphia, Pa. Filed March 18, 1901.

TELEPHONES AND TELEPHONE APPARATUS.

674,402. Telephone-Switchboard. Harold A. Douglas, Grand Rapids, Mich., assignor to Peter C. Burns, Chicago, Ill. Filed Nov. 2, 1898.

674,515. Calling Apparatus for Party Telephone-Lines. Joseph J. O'Connell, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Dec. 26, 1899.

674,541. Protector for Telephone or Telegraph Instruments. Jean Piel, Schöneberg, near Berlin, Germany, assignor to Aktiengesellschaft Mix & Genest, Telefon-und Telegraphen-Werke, Berlin, Germany. Filed Nov. 2, 1900.

674,807. Telephone System. Ernest E. Yaxley, Chicago, Ill., and Charles C. Cadden, Cleveland, O. Filed Dec. 16, 1899. Renewed April 11, 1901.

MISCELLANEOUS.

674,372. Automobile Vehicle. James C. Anderson, Highland Park, Ill. Filed Sept. 6, 1900.

674,396. Push-Button. Sigmund Bower, Brooklyn, N. Y. Filed Nov. 26, 1900.

674,407. Mold for Framing Electrodes. Robert J. Guisler, Charlottenburg, Germany. Filed June 28, 1900.

674,427. Apparatus for Collecting Atmospheric Electricity. Andor Palencsar, Budapest, Austria-Hungary. Filed July 10, 1900.

674,469. System of Typewriting Telegraphs. Frank B. Pearne, Grand Island, Neb. Filed Dec. 11, 1900.

674,501. Storage Battery. William Gardiner, Chicago, Ill. Filed Aug. 8, 1900.

674,575. Phonograph. Augustus L. Duweliuss, Cincinnati, O., assignor to Alfred H. Duweliuss and Walter S. Duweliuss, same place. Filed June 20, 1898.

674,665. Power-Transmitting Means for Horseless Carriages. John C. Blevney, Newark, N. J. Filed Jan. 23, 1901.

674,683. Electromagnetic Valve. Nils O. Lindstrom, Borough of Queens, New York City, assignor to Alonzo B. See and Walter L. Tyler, same place. Filed Feb. 4, 1901.

674,780. Electrolytic Process of Purifying Crude Spirits. Jules H. Lavollay and Gustave E. Bourgois, Paris, France. Filed June 8, 1900.

674,794. Power-Transmission Gear. Herbert G. Ogden, Jr., Washington, D. C., administrator of Herbert Churchill Capel, deceased. Filed Dec. 15, 1900.

674,825. Apparatus for Accumulating and Storing Energy. Angel de Castro, New York City, assignor of one-half to Henry W. Schlomann, same place. Filed April 10, 1900.

674,840. Circuit-Controller. Carl Hoffmann, Charlottenburg, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed March 10, 1900.

674,846. Electric Telegraphy. Oliver J. Lodge, Liverpool, Eng. Filed Dec. 20, 1897.

THE TELEPHONE WORLD.

Value of Telephone Lines.

In the People's Telephone Company's office in Detroit, Mich., was recently exhibited a compilation by Judge Thomas, president of the Independent Telephone Association of Ohio, designed to show the value of United States telephone systems and the great growth in the independent telephone movement. Judge Thomas figures that the total valuation of Bell properties in the United States is \$300,000,000, and of the independent properties \$200,000,000. The figures were made by Judge Thomas after published rumors that all Bell telephone companies would be brought together in one corporation with a capitalization of only \$90,000,000.

Forts Michie and Terry, the new Government fortifications protecting the eastern entrance to Long Island Sound, are to be equipped for telephonic and telegraphic communication. The forts are located on Plum and Gull Islands in the Race across from New London harbor. During the late war a cable was stretched across from New London connecting the forts, but the cable was damaged in the seaway and the service was not continued. The proposed cable will be laid under the supervision of Capt. Nelson Samuel Raver. The cable will be laid from the fortifications to Goshen Point, and there it will be connected with the terminal of the Southern New England Telephone Company at New London.

The Dubois County, Ind., Telephone Company, which has been working in the vicinity of Jasper for some weeks, has opened its exchange in that place to the public, and all subscribers have free service to Tell City, Cannelton, Troy, St. Meinrad, Gentryville, Dale, Leavenworth, Corydon, Marango and all towns along the Air-Line east to New Albany, Salem, Paoli, West Baden, French Lick, Winslow, Petersburg, Washington and a score of other towns.

A report from Sioux City, Ia., states that the Western Electric Telephone Company has come into possession of the Greene & Western Company's system, including 450 miles of toll line and exchanges at Mason City, Charles City and Osage in that State. The concern now reaches every town in the northwestern twenty-six counties of Iowa, with a number of local exchanges. Three hundred miles of toll lines are to be built in Minnesota and South Dakota.

According to a Kansas City paper, sixteen Missouri telephone lines, owned and operated by the Standard Telephone Company, were ordered sold by Judge Gibson recently. The court's order provides for a public sale at the county court house in that city between the hours of 2 and 5 o'clock on the afternoon of June 5. Clarence S. Palmer, receiver for the company, was authorized to sell the property to the highest bidder.

The Pennsylvania Telephone Company has made arrangements to put up larger cables between the local exchange and Harrisburg. The cables are now on hand, and will be placed in position within a short time. The work of erecting poles in place of those worn out by long usage has been about completed, and the force of linemen will soon be started at their portion of the improvement.

L. E. Samson, of Tacoma, Wash., has applied to the city council for a 25-year franchise for a new telegraph and telephone system. The names of his principals have not been disclosed. Independent systems exist at Portland and Seattle. It is believed that they will be connected by another long-distance line, of which the proposed new system there will be a part.

The Eastern Telephone & Telegraph Company is to extend its lines to Atlantic City and Cape May, N. J. This was decided upon at the annual meeting of stockholders. Connections will also be made with the Keystone Company of Philadelphia. The company has spent about \$150,000 in extending its service during the past year.

The Cynthiana, Ky., Telephone Company has amended its charter and increased the capital stock to \$30,000. This company is preparing to run lines to nearly every postoffice in Harrison County, and will connect with exchanges of adjoining counties.

The New England Telephone & Telegraph Company will erect an exchange in Holyoke, Mass. The equipment will be equal to that of any exchange in New England.

The Delmarva Telephone Company has been granted permission to construct a line from Iron Hill to Perryville, with connections at Elkton, Northeast and Principio, Md.

Construction work on the Madisonville, Tenn., telephone exchange has been completed.

Telephone Rates in Washington.

Last week the Court of Appeals of the District of Columbia affirmed the constitutionality of the act of Congress of 1898 reducing by about 40 per cent. telephone rates in the city of Washington, thus reversing the judgment of Justice Barnard of the Supreme Court of the District of Columbia.

The telephone company refused to reduce its charges to the rates fixed by the act, alleging it unconstitutional for the reason that it interfered with chartered rights and the service could not be performed at the prices fixed. Justice Barnard held the act unconstitutional and the case was carried to the Court of Appeals, which reversed that judgment and directed the granting of the injunctions. An appeal will probably be taken to the Supreme Court of the United States.

There is pending before the board of public works a petition on the part of the Seattle, Wash., Electric Company for a permit to establish a system of telephone boxes and booths for use in connection with the street railway lines of the company. The system is very similar to that in use by the police department, and contemplates furnishing a means for immediate communication with headquarters by any motorman or conductor whose car is in trouble from any cause. It frequently happens that in the suburban districts especially a car becomes derailed or in some other difficulty. The motorman is sometimes detained many minutes in seeking a telephone by which to communicate his difficulty to the power house. The proposed system would furnish regular opportunities for such communication, and would obviate many delays and difficulties to which the traveling public might be, and indeed is, subjected. It is probable that the permit asked for will be granted in a modified form, restricting the telephone to the outlying districts, and limiting the company to the use of boxes in the downtown sections.

The petition of its New England Telephone Company for the privilege of putting its wires underground, will probably be considered at the next meeting of the board of Burlington, Vt., aldermen. The cost of the work has been figured at from \$15,000 to \$20,000, and will include changing the wires on a number of streets. The work, if sanctioned by the aldermen, will be done at once, as the exchange is likely to be moved into larger quarters and the service improved. These improvements are promised if the company is allowed to put its wires underground.

J. E. Mott is in Pueblo, Col., from Michigan, representing an Eastern telephone company, which he says is headed by Matthew Fluh of Mt. Clemens, Mich. He is trying to interest the business men in a new telephone system which he proposes to introduce, providing he can get the necessary franchise from the city council. He claims the new 'phone will be much cheaper than the present service, and will be rented at a reduction of about 40 per cent. on the present prices. He will appear before the council with his proposition at its next meeting.

The entire business of the Central Telephone Company of Des Moines, Ia., which is a toll line system, was lately sold to the Jasper County Telephone Company, which has headquarters at Newton, Ia. The Central has operated 31 telephone stations in Central Iowa, extending from Boone to Oskaloosa.

Assemblyman Gilman, Attorney Linderman, of Osseo, Wis., and other prominent men interested in the Osseo Telephone Company, have recently been in Eau Claire, and at the council meeting the company's application for a franchise in Eau Claire was presented and ordered published.

The Independent Telephone Company of Waco, Tex., has obtained permission from the city council of Marlin to extend its line into the latter city and open an exchange there. Work on this extension is to commence at once.

The Brilliant, O., town council has granted a franchise to the Phoenix Telephone Company to put in an exchange at Brilliant. A wire will connect Brilliant and Wellsburg, crossing the river at about the central part of the town.

The New York Telephone Company has bought three three-story dwellings, Nos. 123-127 East 124th street, adjoining its present exchange in this city. An addition will be built with a frontage 49.4 feet.

The extension of the Anderson telephone line from Plantersville to Bobbin, Tex., was completed recently.

Work on the telephone system at Woonsocket, S. D., has been completed, and the plant is now in use.

Ericsson 'Phones Popular in India.

The following information on a postal card received from British India is interesting, as it was from a telephone exchange wholly unknown to the Ericsson Telephone Company until the postal card arrived. The particular item of interest is the fact that Ericsson telephones are used and appreciated even in India:

Hyderabad Deccan Telephone Exchange.

Hyderabad Deccan East India.

12th February, 1901.

Manager Ericsson Telephone Company, 305 Broadway, New York City, U. S. A.

Dear Sir: Messrs. Ericsson & Co., of Stockholm, have kindly sent me Part 4 of your "Telephone Information." Please send me Parts 1, 2 and 3 to complete the series. The "Ericsson" telephone sets are the best in the world and we use them here.

Yours faithfully,

H. NEALE, Sup't.

Milwaukee, Wis., will have another telephone company shortly, articles having been filed with the register of deeds incorporating the Kurtz National Telephone Company. This company will construct and operate telephone and telegraph lines, manufacture telephones and electrical apparatus. The capital of the company is \$35,000 in shares of \$10. The incorporators are: J. W. Murphy, J. M. Clarke and P. J. Schmitt.

The Nebraska Telephone Company in Wymore is removing wires and substituting cables, each of which hold 100 wires. Improvements now under way will increase the capacity of the exchange to 400 instruments, more than half of which have already been placed. Connections with the line down into Kansas via Barneston have been completed.

Without solicitation by their employees, the Southern New England Telephone Company has announced a new working schedule which will make a nine-hour day. Nearly 200 men scattered all over the State of Connecticut will benefit by this act of the company. The new rule goes into effect on June 2.

The Dutchess County Telephone Company, which is now placing a telephone system in Poughkeepsie, N. Y., has filed a mortgage of \$100,000 in the office of the county clerk. The idea is to secure bonds for a like amount to be issued and sold. The mortgage is made out to the Phoenix Telephone Company.

Articles of incorporation of the new People's Telephone Company, recently organized in Detroit, Mich., to compete with the Bell Company, are ready to be filed at Lansing as soon as signed. The capital stock is \$2,500,000, 70 per cent. owned by the Everett Moore syndicate, of Cleveland, and 30 per cent owned in Detroit.

The people of Pine and Buffalo, Col., are rejoicing over the prospect of soon being in telephonic communication with the outside world. Work has begun on a branch from the toll road line, which will come down Elk Creek canon to Pine, and then down Platte canon to Buffalo. The contractors expect to complete the work by June 1.

Charles R. Duffin, of Terre Haute, Ind., vice-president and general manager of the Citizens' Telephone Company, appeared before the city council at Brazil in that State in the interest of the new independent telephone company which is seeking a franchise there.

The refusal of the common council to grant the Century Telephone Construction Company a franchise will not prevent the installation of a third system of telephonic communication in Ithaca, N. Y.

TELEPHONE INCORPORATIONS.

The Springfield Home Telephone Company, Springfield, O. Capital stock, \$300,000.

The Interstate Telegraph & Telephone Company, Ashdown, Ark. Capital stock, \$50,000. Incorporators: Wm. M. Freeman and Frank A. Locke, Ashdown; Lawrence A. Byrne, Texarkana.

The Wakarusa Telephone Company, Wakarusa, Ind., Capital stock, \$10,000. Directors: George D. Lint, Charles W. Miller and Frank W. Brown.

The Antiseptic Telephone Appliance Company, Jersey City, N. J. Capital stock, \$500,000. Incorporators: Edw. S. Chambers, Thomas A. Hickey and Paul Ryder, all of Jersey City.

The Valley Telephone Company, Wilmont, O. Capital stock, \$1,000. Incorporators: J. W. Moyer, E. C. Cotton, H. F. Christman, J. O. Newcomer and A. L. Deal.

GENERAL ELECTRICAL NEWS.

Lighting.

Clarksville, Ga.—This town will vote June 10 upon the issuance of \$10,000 of bonds for an electric light plant.

Cleveland, O.—Sealed proposals will be received by the county commissioners of Cuyahoga County at their office in the old court house, until 12 o'clock M. June 5, 1901, for the furnishing of apparatus and erecting same, or parts thereof, at the option of the bidder, necessary for the electric light plant to be installed in the old court house in this city and in accordance with the plans and specifications on file in the office of the county commissioners and in the office of George S. Rider, consulting engineer, Century Building, Cleveland, O.

Clarendon, Tex.—The Clarendon Electric Light & Power Company has been organized with \$6,000 capital stock, for the establishment of an electric light plant.

Council Bluffs, Ia.—The Council Bluffs Gas & Electric Light Company is preparing to erect its new electric light plant.

Danville, Va.—The electric light plant here has been shut down on account of the floods.

Douglas, Ga.—G. Young of Atlanta will apply for a charter to erect an electric light plant here.

Elyria, O.—The Elyria Gas & Electric Light Company has in contemplation extensive additions to its electric light plant.

Ellisville, Miss.—T. V. Hall, civil engineer of West Point, Miss., has been appointed consulting engineer to design and supervise the proposed \$15,000 electric light plant here. The contract will be let June 15.

Emporium, Pa.—G. Metzger has been awarded the contract for the construction of an electric light plant at this place.

Fishkill Landing, N. Y.—It is announced that the Rhinebeck Gas Company will go out of business, the company having lost all except six of its customers through electric light competition.

Georgetown, Ky.—An electric light plant will soon be built here.

Glencoe, Minn.—The Glencoe Electric Light Company has been incorporated with the Secretary of State, capitalized at \$25,000.

Henderson, Tex.—This place will have an electric light plant in the near future.

Houston, Tex.—An ordinance was recently passed ordering an election to vote for an additional \$100,000 for an electric light plant.

Independence, Mo.—The chairman has appointed a committee consisting of Mayor Woodson and Councilmen White and Minarup to look into the matter of selecting a location and constructing an electric light plant.

Kingsley, Ia.—The question of erecting an electric light plant here is being agitated.

Marion, Ky.—The Marion Light & Ice Company will erect an electric light plant.

McKeesport, Pa.—P. J. Murphy, a member of the council, has presented an ordinance authorizing the city controller to advertise the sale of \$50,000 in bonds for the erection of an electric light plant.

Monticello, Ga.—Bonner Jordan has received a franchise for an electric light plant in this city.

Newark, N. J.—Electric lighting of the city by a plant owned by the city is being considered by the board of works.

North Platte, Neb.—Lester Walker, who was granted a franchise for the construction of an electric light plant here, has decided to accept the terms and will start work at an early day.

Pana, Ill.—Pana is figuring on erecting an electric light plant.

Pierre, S. D.—The Pierre city council is considering a proposition to put in an incandescent electric lighting system.

Pratt City, Ala.—E. Hudnall and associates have petitioned this city for a franchise for the erection of an electric light and power plant.

Rockville, Md.—The power house, which furnished electric lights and the water pump for this place, with

all machinery and apparatus, was totally destroyed by a recent fire. The loss is estimated at \$7,000.

Rockingham, N. C.—Rockingham wants bids and specifications for an electric lighting plant. Address H. L. Ledbetter, chairman.

Statesboro, Ga.—The Statesboro Manufacturing Company is in the market for machinery for electric lighting purposes. Address D. P. Averitt.

Tekamah, Neb.—An electric light plant will soon be built here.

Victor, Col.—The Pike's Peak Power Company has been granted permission to erect an electric light plant here.

Street Railways.

Ann Arbor, Mich.—W. B. Hatch of Detroit has asked the city council of this place for a franchise for an electric road from Adrian to Ann Arbor.

Cleveland, O.—The Southern Ohio Traction Company, controlled by Cleveland capitalists, has announced its intention to build two new roads to be operated in connection with its main line. The Hamilton, Oxford & Western Railway will extend from Hamilton to Oxford and College Corner into Indiana.

Clinton, Ill.—H. W. Knight, representing Eastern capitalists, who are promoting the proposed electric railway from Lexington to Decatur through this place, is arranging to secure a franchise to run the road through Clinton.

Findlay, O.—An electric road from here to Ft. Wayne, passing through Columbus Grove and Kalida, will probably be built soon.

Huntsville, Ala.—Surveys are about completed for the extension of the Huntsville Electric Railway line of which T. C. Dupont is president.

Kaukauna, Wis.—The Wisconsin Traction, Light, Heat & Power Company has been given the right to construct tracks in the limits of this city on certain streets.

Lehigh, Pa.—I. A. Sweigard of the Reading Terminal has perfected arrangements for the erection of a large power house here for the Carbon County Electrical Railway Company. Estimated cost, \$75,000.

Lenox, Mich.—Much interest is felt over the proposed new electric railway from here to Sanilac Center, of which Gil R. Lovejoy, the treasurer of Macomb County, is a promoter. Mr. Lovejoy says the road is a sure thing and that the money is ready as soon as the details are arranged.

Lima, O.—The Lima, Delphos, Van Wert & Ft. Wayne Traction Company has been incorporated by Lima and Cleveland capitalists. The line will parallel the Pittsburgh, Ft. Wayne & Chicago branch of the Pennsylvania system.

North Salem, N. Y.—The Golden Bridge Electric Railroad Company has been incorporated to construct and operate a street surface road between here and Ridgebury, Conn., with a capital of \$100,000. E. B. Brady of Golden Bridge, F. W. Siebert of Waterbury, Conn.; William H. I. Howe, and John Brophy of Ridgefield, Conn., are all interested in the scheme.

Penn Yan, N. Y.—At the annual meeting of the stockholders of the Newark-Marion Electric Railway Company, C. L. B. Tylee of this place was elected president and general manager. The work of building the road is expected to begin June 1.

Richmond, Va.—A company has been formed for the construction of an electric line from Fulton to Warwick Park on the river, about six miles below this city. All the necessary stock has been subscribed.

Spokane, Wash.—A new electric line is under consideration. It is to run from this city north to the granite quarries on the Little Spokane River, and will make possible cheap transportation to summer resorts in a picturesque section of country.

West Chester, Pa.—A number of Chester County people have organized a movement with the object of connecting Oxford and Parkersburg by trolley. The proposed road will be 14 miles long, and will touch Cochranville. A company has already been organized

under the name of the Oxford, Cochranville & Parkersburg Electric Railway Company, and a charter will be applied for immediately. The officers are: President, Thomas O'Connell; secretary, Robert L. Hayes; treasurer, Plummer E. Jefferis.

Manufacturing.

Buffalo, N. Y.—The Electric Typewriter Company has been formed to manufacture typewriting devices, with a capital of \$100,000. James A. Roberts, Edward Michael and Joseph B. Roberts of Buffalo, Joseph L. McEntee of Albany, and Harry Bates of Rensselaer, are the directors of the concern.

Butler, Pa.—The United States Electrical Manufacturing Company, capitalized at \$100,000, was organized a short time ago.

Watertown, N. Y.—Articles incorporating the Eager Electric Company of this city have been filed at Albany. It is proposed to manufacture and sell electric machinery. Henry Eager Frank M. Bosworth and Albert H. Lafebre, of Watertown, are the promoters of this concern, which is capitalized at \$10,000.

Company Matters.

Chicago.—The Graham Manufacturing Company of this city has changed its name to the National Gas & Electric Fixture Company.

New Market, N. H.—At a recent meeting of the stockholders of the Newmarket Electric Light, Power & Heat Company, held a short time ago, it was voted to increase the stock \$12,000, making the total amount of the capital \$22,000.

New York City.—A new company purposes to install a pneumatic tube service between this city and Boston, under the name of the Electric Pneumatic Company of Hartford. The incorporators, who are Connecticut men, represent interests in New York and Boston, and intend to equip a through express service between those two cities, connecting with all the important centers on the way. The company starts in with \$5,000,000 capital stock.

Power and Transmission.

Philadelphia, Pa.—Rumors are now afloat to the effect that a syndicate composed of Philadelphia and New York capitalists have arranged to acquire control of the project, first suggested in Baltimore, to utilize the water power of the lower Susquehanna River in Maryland for the generation of electricity on a large scale.

York, Pa.—The project of harnessing the Conewago Falls, on the Susquehanna River at York Haven, 10 miles from here, will soon be an accomplished fact. Judge Stewart, who has had this matter in charge for several years, has announced that he has sold all the bonds necessary to develop the property to a banking company of Philadelphia, and the first payment will be made on June 1, and the work of development will be pushed to a speedy conclusion. The first line for transmission of current will be built to this city, and other lines to Lancaster and Harrisburg.

Mines.

Denver, Col.—The Woods Investment Company, operating a lease on the May Belle claim of the Cripple Creek Gold Exploration Company, known as the Lawrence Townsite, has installed an electric hoist on the property and commenced sinking the shaft to the 500-foot point. The hoist is run by power from the Pike's Peak Power Company.

Automobiles.

Wilmington, Del.—The Observation Automobile Company of Washington, with a capital of \$100,000, was lately incorporated here to build, operate, sell and lease automobiles for the transportation of passengers.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by **ELECTRICITY** from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mgr., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Author'd	Issued.				
Albany, N. Y. —May 28					
United Traction.....	100	\$5,000,000	\$5,000,000	1 1/4 % Q.	105 108
(Consolidation of the Albany and Troy City Railway.)					
Allentown Pa. —May 28					
Allentown & Lehigh Val. Trac Co		4,000,000	1,500,000		15
Bridgeport, Conn. —May 28					
Bridgeport Traction Co.	100	2,000,000	2,000,000	1 % Aug.	103
Baltimore Md. —May 28					
United Railways & Elec. Co. com.	50	24,000,000	18,000,000		17 1/4 17 1/2
Boston, Mass. —May 28					
New England Street Ry.....	25	5,000,000	1,081,925	1 % Q., Jan. 15,	
North Shore Traction Co. com.	100	4,000,000	4,000,000		15 16
North Shore Traction Co. pfd.	100	2,000,000	2,000,000	5 % S. A. & O.	85 87
West End Street Ry. Co. com.	50	10,000,000	5,000,000	3 1/2 % S. Oct.	95 95 1/2
West End Street Ry. Co. 3 % pfd.	50	4,000,000	4,000,000	4 % S. Jan.	114 115
Boston Elevated R. R.	100	10,000,000		2 1/2 % Aug. 99,	79 181
Brooklyn N. Y. —May 28					
Brooklyn City Ry.....	100	2,000,000	1,928,400		94 1/2 94 1/2
Brooklyn Rap. Transit Co., tr. cert.	100	48,000,000	48,000,000		75 1/4 75 1/2
Brooklyn Heights Railroad.....	100	200,000	200,000		107 109
Brooklyn City RR.....	100	12,000,000	12,000,000	3 1/2 % Q., Jan.	267 269
Brooklyn, Queens Co. & Sub. RR.	100	2,000,000	2,000,000		325 326
Coney Island & Brooklyn RR.....	100	2,000,000	1,884,200	2 1/2 % Nov.	82 83
Kings County Elevated.....	100	4,750,000	4,750,000		
Kings County Traction Co.....	100	4,500,000	4,500,000	1 % July	
Nassau Electric Railroad.....	100	6,000,000	6,000,000		
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000		
Brooklyn, B. & W. R. Railroad.....	100	1,000,000	1,000,000		
Buffalo N. Y. —May 28					
Buffalo & Niagara Falls Elec. Ry.....	100	1,250,000	1,250,000		74 75
Buffalo Railway Co.....	100	6,000,000	5,870,500	1 % Q. Dec.	99 100
Columbus O. —May 28					
Columbus Street Railroad.....	100	5,000,000	5,000,000	1 % Q., Feb.	88 88 1/2
Columbus Street Railroad, pfd.....	100	1,500,000	1,500,000		92 93
Charleston, S. C. —May 28					
Charleston City Ry. Co.....	50	100,000	100,000	3 % S.	
Enterprise City RR. Co.....	25	1,000,000	250,000		
Chicago, Ill. —May 28					
Chicago City Ry. Co.....	100	12,000,000	12,000,000	3 % Q., Dec. 31,	250 260
Chicago & South Side R. T. RR.....	100	10,328,800	10,328,800		18 1/4 14
Lake Street Elevated RR.....	100	10,000,000	10,000,000		81 1/2 81 1/2
Metropolitan West Side Elev. Ry.....	100	15,000,000	7,000,000	Feb 28 1900.	86 86 1/2
Met. West Side El., pfd.....	100	15,000,000	9,000,000		209 210
North Chicago Street Ry.....	100	10,000,000	6,000,000	3 % Q., Jan.	197 200
North Chicago City RR.....	100	500,000	249,900		108 109
South Chicago City Railway.....	100	2,000,000	1,608,200		105 105 1/2
West Chicago St. RR. Co.....	100	20,000,000	18,189,000	1 1/2 % Q., Feb.	17 1/4 17 1/2
Union Traction Ry. Co. com.	100	1,250,000	624,900	3 % S.	58 58 1/2
Union Traction Co. pref.	100	2,000,000	2,000,000		
Cincinnati, Ohio. —May 28					
Cincinnati Inc. Plane Ry.....	50	1,000,000	575,000		
Cincinnati Inc. Plane Ry. pfd.	50	150,000	150,000	3 % Feb.	
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	3 % Feb.	75 76
Cincinnati Street Ry. Co.	50	18,000,000	14,000,000	1 1/2 % Q., Jan.	124 125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1 1/2 % Q., Jan.	126 127
Cleveland, Ohio. —May 28					
Akron, Bed. & Elev. Elec. Ry.....	100	1,000,000	1,000,000	3 1/2 % Jan.	48 50
Cleveland City Ry.....	100	8,000,000	7,600,000	3 1/2 % Jan.	102 102 1/2
Cleveland Electric Ry.....	100	12,000,000	12,000,000	3 % Q., Oct.	88 84 1/2
Detroit, Mich. —May 28					
Detroit Citizens' Street Ry.....	100	2,000,000	1,250,000		100 100
St. Wayne & Belle Isle Ry.....	100	250,000	1,200,000		175 175
Rapid Railway Co.....	100	250,000	250,000		90 100
Detroit Electric Railway.....	100	1,000,000	1,000,000		
Wyandotte & Detroit River Ry.....	100	250,000	200,000		100 110
Dayton O. —May 28					
City Railway Co.....	100	1,800,000	1,470,600	1 1/2 % Q.	140 145
City Railway Co. pfd.....	100	600,000	600,000	1 1/2 % Q.	170 170
People's Street Railway.....	100	1,100,000	1,100,000		114 115

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Author'd	Issued.				
Hartford Conn. —May 28					
Hartford Street Ry. Co.....	100	\$4,000,000	\$200,000	3 % A. Oct.	190
Hartford & West Hartford.....	100	1,000,000	247,000		
Holyoke Mass. —May 28					
Holyoke Street Ry. Co.....	100	400,000	400,000	4 % A., June,	207 1/2 212
Hoboken N. J. —May 28					
North Hudson Co. (N. J.) Ry. Co.	25	1,250,000	1,000,000	5 %	190
Indianapolis, Ind. —May 28					
Indianapolis Street Ry.....	100	5,000,000	5,000,000		25 25 1/2
Lancaster, Pa. —May 28					
Pennsylvania Traction Co.....	100	10,000,000	2,900,000		
Lancaster & Col. Electric Ry.....	100	10,000,000	87,500		
West End Street Railway.....	100	10,000,000			
Louisville, Ky. —May 28					
Louisville Ry.....	100	4,000,000	3,500,000	1 1/2 % April,	82 83
Louisville Ry.....	100	2,500,000	2,500,000	2 1/2 % S., Oct. 1,	112 113
Minneapolis, Minn. —May 28					
Twin City Rapid Transit.....	100	17,000,000	15,010,000		88 1/2 89 1/2
Twin City Rapid Transit.....	100	8,000,000	1,712,200	1 1/2 % Oct.	166 167
Montreal, Canada. —May 28					
Montreal Street Ry. Co.....	50	4,000,000	4,000,000	3 % S. M. & N.	179 180
Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1 1/2 % S. J. & J.	104 104 1/2
Memphis Tenn. —May 28					
Memphis Street Railway Co.....	100	500,000	500,000		25
New Haven, Conn. —May 28					
Fair Haven & Westville RR.....	25	2,000,000	2,000,000	3 % S., Sept.	39 41
New Haven Street Railway Co.....	100	1,250,000	1,000,000	2 1/2 % A., July	
New Haven & Centerville.....	100	700,000	800,000		
Winchester Avenue RR.....	25	1,000,000	500,000		45 46
New Orleans, La. —May 28					
Canal & Claiborne RR. Co.....	40	240,000	240,000	1 % S., July,	
New Orleans & Carrollton RR.....	100	1,200,000	1,200,000	1 1/2 % Q., Oct.	143 1/2 153
New Orleans Traction Co new com.	100				22 1/2 24
New Orleans Traction Co new pfd.	100				95 98
Orleans City RR.....	100	2,000,000	2,000,000	3 % S., Jan.	20 26
New Or. City & Lake RR.....	100	2,000,000	2,000,000	1 % S., Jan.	
Orleans Railroad.....	50	500,000	185,000	1 1/2 % June,	52 52
St. Charles Street Railway.....	50	1,000,000	1,000,000	1 1/2 % Oct.	56 57
New York —May 28					
Central Croton RR.....	100	600,000	600,000	2 1/2 % Q.	255 260
Christopher & 10th Sts. RR. guar.	100	650,000	650,000	2 % Q., Oct.	175 185
Dry Dock, E. Brdwy & Battery RR.	100	1,200,000	1,200,000	1 1/2 % Q., Nov.	120 125
Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000	2 1/2 % Q., Feb., 1900.	168 1/2 168 1/2
Bleecker St. & Fulton St. Ry. guar.	100	900,000	900,000	1 1/2 % A., July,	65 67
Broadway & Seventh Ave. RR. guar.	100	2,100,000	2,100,000	1 1/2 % Q.	226 240
Gen. Park N. E. Rivers RR. guar.	100	1,800,000	1,800,000	2 1/2 % Q.	205 210
42d St. & Grand St. Ferry RR. guar.	100	1,000,000	1,000,000		394 406
19th Avenue RR.....	100	750,000	748,000	4 1/2 % Q.	362 402
46th Avenue RR.....	100	800,000	800,000		138 201
20th Avenue RR.....	100	2,000,000	2,000,000		383 403
Second Avenue RR.....	100	600,000	600,000	1 1/2 % Q.	400 410
Third Avenue RR.....	100	2,500,000	1,862,000	2 % Q., Jan.	2 5 312
42d St. Manhattan & St. Nich. Av.	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.	124 1/2 125
Union (Huck) RR.....	100	2,500,000	2,500,000		60 75
Newark N. J. —May 28					
Consolidated Traction Co. of N. J.	100	15,000,000	15,000,000		67 1/2 68
North Jersey Railway Co.....	100	6,000,000	6,000,000		24 1/2 21 1/2
United Elec. Co. of New Jersey.....	100	504,000	504,000	1 1/2 % A.	215 216
Pittsburg, Pa. —May 28					
Allegheny Traction Co.....	50	500,000	500,000		27 28
Consolidated Traction Co. com.	50	15,000,000	15,000,000	1 % Jan.	26 1/2 26 1/2
Consolidated Traction Co. pfd.	50	9,478,850		1 % Nov.	63 63
Central Traction Co.....	50	1,500,000		1 % Nov.	76 1/2 76 1/2
Quakers' Traction Co.....	50	8,000,000		1 % A.	72 1/2 72 1/2
Duquesne Traction Co.....	50	8,000,000		1 % A.	
Pittsburg Traction Co.....	50	2,500,000		1 % Nov.	
Federal St. & Pleasant Valley Ry.....	25	1,400,000		1 % July,	
Pgh., Allegheny & Man. Trac. Co.....	50	8,000,000		1 % Aug.	
Pittsburg & Birmingham Trac. Ry.....	25	1,500,000		1 % Oct.	
Pittsburg & West End Ry.....	50	6,000,000		1 % A., June	41 41 1/2
United Traction Co.....	50	17,000,000		J. & J.	18 1/2 18 1/2
United Traction Co. pref.	50	8,000,000		J. & J.	81 1/2 82

* Unlisted. * Ex div.
 a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.
 b Leased to Boston Elevated Railroad Company.
 c Owned by Brooklyn Rapid Transit Company.
 d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
 e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
 f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
 g Owned by Atlantic Ave. RR. and leased to Nassau system.
 h \$200 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; \$250.00 of stock owned by North Chicago Street Railroad Company.
 i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
 j 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$25,100 of stock owned by West Chicago Street Railroad Company.
 k Majority of stock owned by Chicago West Division Railway Company; 5 % on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
 l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. * Full paid. * Outstanding. * E. & J. Co.
 a Leased to New Orleans Traction Company at 6 % on stock.
 b Leased to New Orleans Traction Company at 8 % on stock.
 c Leased to Central Orleans Traction Company at 8 % on stock.
 d Operating the former Met. Trac. system, that corporation having become extinct.
 e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
 f Leased to Houston, West Street & Pavyon Ferry—now Metropolitan Street Railway.
 g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
 h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1893, at \$215,000 per annum.
 i Leased to Metropolitan Street Railway for 18 % on stock.
 j Leased to Met. St. Ry. for 99 years from April 21, 1892; 6 % first 5 years, 8 % thereafter.
 k Leased to Metropolitan Street Railway for \$145,000 per annum.
 l Leased to Metropolitan Street Railway for 18 % on capital stock.
 m Controlled by Third Avenue Railroad by purchase.
 n Dividends of 1 1/2 % yearly guaranteed by Consolidated Traction Company.
 o Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pgh. Traction.
 p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
 q Leased to Fort Pitt Traction Company for 8 % on \$8,000,000 capital stock.
 r Leased to Consolidated Traction Company for 4 % on capital stock.
 s Leased to Consolidated Traction Company for 7 % on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par.	Capital Stock.		Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par.	Capital Stock.		Rate and Date of Last Div.	Bid.	Asked.
		Author's'd.	Issued.						Author's'd.	Issued.			
New Bedford Mass. —May 28							Boston, Mass. —May 28						
Union Street Railway Co.....	100	\$350,000	\$350,000	2 % Feb.	160	165	American Tel. & Tel. Co.....	100	50,000,000	28,550,000	4 1/2 % Q. Jan.	178	178 1/2
Northampton, Mass. —May 28							Erie Telegraph & Telephone Co.....						
Northampton Street Ry.....	100	500,000	225,000	4 % A. June.	170	178	New England Telephone Co.....	100	10,894,800	10,894,800	\$1.50 p. sh. Feb.	189	149
Omaha, Neb. —May 28							New York. —May 28						
Omaha Street Ry.....	100	5,000,000	5,000,000	8 % A. and N.	55	65	American Telegraph & Cable Co.....	100	14,000,000	14,000,000	1 1/2 % Q.	91	94
Paterson, N. J. —May 28							*Central & South Am. Tel. Co.....						
Paterson Ry. Co.....	100	1,250,000	1,250,000	.....	54	—	*Commercial Cable Co.....	100	6,500,000	6,500,000	1 1/2 % Q.	160	105
Providence, R. I. —May 28							Franklin Tel. Co.....						
United Traction & Electric Co.....	100	8,000,000	8,000,000	3/4 % Oct.	110	111	Erie Telegraph & Telephone Co.....	100	10,000,000	10,000,000	1 1/2 % Q.	178	175
Philadelphia. —May 28							*Gold & Stock Tel. Co. guar. 6 %						
Fairmount Park Trans. Co.....	50	2,000,000	1,770,000	2 % Dec.	28	24	*International Ocean Tel. Co. guar. 6 %	100	1,000,000	1,000,000	1 1/2 % S.	42	50
Hestonville, Man. & Fairmount.....	50	1,966,100	1,966,100	2 1/2 % July 15.	47	48	Mexican Telephone Co.....	100	5,000,000	4,800,000	1 1/2 % Q. Feb.	116	118
Hestonville, Man. & Fairmount.....	50	588,900	588,900	8 % S. July.	75	76	*New York & New Jersey Tel. Co.	100	5,000,000	.....	1 1/2 % Q.	116	118
Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	8 % Feb. 1.	27 1/2	28	*Pacific & Atlantic Tel. guar. 4 %	100	8,000,000	.....	1 1/2 % Q.	3	8 1/2
Union Traction Co.....	50	80,000,000	29,930,450	.....	81	81 1/2	*Postal Telegraph Cable Co.....	100	2,000,000	.....	.....	163	168
Electric Traction Co.....	50	500,000	192,500	8 share Q.	45	—	*Sout'n & Atlantic Tel. Co. guar. 5 %	25	5,000,000	8,728,000	2 1/2 % Q. Jan.	70	75
Frankford & Southwark Pass. Ry.	50	1,000,000	1,875,000	8 1/2 share A—Apr.	48	45 1/2	*Commercial Union Telegraph Co.	25	2,000,000	.....	2 % S.	95	100
Lehigh Avenue Ry. Co.....	50	1,000,000	1,000,000	A. & O.	90	90 1/2	Western Union Telegraph Co.	25	500,000	500,000	8 % S. Jan.	115	—
Lombard & South Street Ry.	25	1,000,000	1,000,000	.....	300	—	†Div. guar. by Postal Tel. Co.	—	—	97,870,000	1 1/2 % Q. Jan.	91	91 1/2
Second & Third Streets Ry.	50	1,000,000	771,076	8 share A. Mar.	151	—	Miscellaneous. —May 28						
People's Traction Co.....	50	10,000,000	10,000,000	8 % A. April.	151	152	American Dist. Tel. (Phila.).....	25	400,000	.....	1 % Q.	26	27
Germanstown Passenger Ry.	50	1,500,000	572,800	8 % Jan.	152	—	Bell Teleph. Co. (of Canada).....	100	8,960,000	8,564,000	2 % S.	188	—
Green & Coates Passenger Ry.	50	500,000	150,000	.....	97	97 1/2	Chesapeake & Potomac Tel. Co.	100	—	—	.....	67	70
People's Passenger Ry.....	25	1,500,000	740,000	.....	108	208 1/2	Chicago Telephone Co.....	100	—	—	.....	200	210
People's Passenger Ry. com.	50	750,000	277,402	.....	100	—	Central Dist. Prtg. & Tel. Co. (Pgh.)	100	750,000	750,000	.....	148	150
People's Passenger Ry. pfd.	50	30,000,000	120,000,000	8 1/2 p. sh. Oct.	97	97 1/2	Empire & Bay States Telegraph Co.	109	2,000,000	2,000,000	1 % Q.	120	125
Philadelphia Traction Co.....	50	1,000,000	400,000	6 % A—Mar.	58	57	Hudson River Telephone Co.	109	2,000,000	2,000,000	1 % Q.	120	125
Oatherine & Bainbridge St.	50	1,000,000	1,000,000	8 share July	108	208 1/2	*Northwestern Telegraph Co. guar.	50	2,500,000	2,500,000	2 1/2 % Q.	122	125
Continental Pass. Ry. guar.	50	600,000	600,000	.....	100	—	Providence (R. I.) Tel. Co.	50	—	—	.....	16	99
Empire Passenger Ry. Co.	50	1,000,000	475,000	8 1/2 share July	108	208 1/2	Southern New Eng. Tel. Co.	100	8,000,000	.....	.....	—	—
Philadelphia City Pass. Ry.	50	1,000,000	298,650	12 share July	100	—	ELECTRIC LIGHT AND ELECTROIAL MFG. CO.S						
Philadelphia & Gray's Fy. RR.	50	750,000	420,000	12 share July	100	—	Boston, Mass. —May 28						
Ridge Avenue Passenger Ry.	50	750,000	200,000	1 1/2 % S. July.	100	—	Fort Wayne Electric trust receipts..	—	—	—	.....	115	125
Philadelphia & Dart. Ry. guar.	50	—	250,000	1 1/2 % S. July.	100	—	St. Wayne Elec. Co. T. Sec. Series A.	25	—	—	.....	18	25
14th & 19th Sts. Pass. Ry. guar.	50	1,000,000	855,000	11 sh. A. July	100	—	General Electric Co. (old) .. com.	100	40,000,000	80,460,000	2 % Q. Aug. 1898.	222	228
Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	900,000	8 1/2 sh. A. July	100	—	General Electric Co. (new) .. com.	100	18,276,000	18,276,000	1 1/2 % Q. Apr. 1901	222	228
Union Passenger Ry. Co.	50	1,500,000	900,000	8 1/2 sh. A. July	100	—	T. H. Elec. Co. T. Sec. Series C.	50	—	145,700	1 1/2 % Q. Jan.	65	65 1/2
West Philadelphia Pass. Ry.	50	750,000	750,000	10 share July	62	268	Westinghouse Elec. & Mfg. Co. com.	50	4,000,000	3,996,053	1 1/2 % Q. Jan.	75 1/2	76
Rochester, N. Y. —May							Westinghouse El. & Mfg. Co. rights.						
Rochester Railway Co.....	100	5,000,000	5,000,000	.....	19	81	50	11,000,000	8,195,126	.....	134	134 1/2	
Reading, Pa. —May 28							New York. —May 28						
Reading Traction Co.....	—	1,000,000	1,000,000	Semi-an. Jan. & J.	24	26	Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	.....	119	120
Reading Passenger Ry.....	50	850,000	850,000	Jan. '98.	138	—	*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1 1/2 % Oct. '98.	8	—
East Reading Electric Ry.....	50	1,080,000	1,000,000	Jan. '98.	70	—	Edison Ore Milling Co.....	100	—	—	.....	12	—
St. Louis Mo. —May 28							Electric Vehicle Co.....						
South Street & Arsenal Ry.....	50	800,000	150,000	.....	—	—	General Electric Co. (old) .. com.	100	40,000,000	80,460,000	2 % Q. Aug. 1898.	222	228
Jefferson Avenue Ry. Co.....	50	400,000	400,000	2 % Dec.	—	—	General Electric Co. (new) .. com.	100	18,276,000	18,276,000	1 1/2 % Q. Apr. 1901	222	228
Lindell Ry.....	100	2,500,000	2,400,000	1 1/2 % Jan. '99.	—	—	Interior Conduit & Insulation Co.	100	1,000,000	1,000,000	.....	41	—
National Railway Co.....	—	2,500,000	2,479,000	1 1/2 % Jan. '99.	—	—	Kings Co. El. L. & P. Co.	100	2,500,000	2,500,000	A. & O.	110	125
Cass Avenue & Fair Grounds.....	100	2,500,000	2,500,000	.....	—	—	Pittsburg, Pa. —May 28						
Ottisens RR.....	100	2,000,000	1,500,000	4 % Oct. '98.	—	—	Allegheny County Light Co.....	100	500,000	500,000	J. & J.	166	172
St. Louis RR.....	100	2,000,000	2,000,000	2 1/2 % Jan. '99.	—	—	East End Electric Light Co.....	50	800,000	800,000	Q.	—	—
Missouri RR.....	100	2,400,000	2,800,000	1 1/2 % Jan. '99.	—	—	Philadelphia, Pa. —May 28						
People's RR. Co.....	50	1,000,000	800,000	50c. Dec. '89.	24	24 1/2	Edison Electric Light Co.....	100	2,000,000	.....	.....	144	144 1/2
United Electric Ry.....	50	500,000	500,000	.....	78	78 1/2	*Electric Storage Battery Co. com.	100	8,500,000	.....	.....	54	55
United Electric Ry. 5 % pref.	100	1,000,000	1,000,000	8 % Jan. '99.	94	94	*Electric Storage Battery Co. pfd.	100	5,000,000	.....	.....	55	56
St. Louis & Suburban Ry.....	100	3,000,000	2,500,000	8 % A. July, '99.	—	—	Northern Elec. Light & Power Co.	10	550,000	550,000	.....	18	18 1/2
Union Depot RR.....	100	4,000,000	4,000,000	8 % A. July, '99.	—	—	Southern Elec. Light & Power Co.	10	187,500	187,500	.....	80	—
San Francisco, Cal. —May 28							Miscellaneous. —May						
California St. Cable RR.....	100	1,000,000	600,000	50c. monthly.	117	119	Bridgeport (Conn.) Elec. Lt. Co.	25	500,000	.....	.....	47	48
Geary Street Park & Ocean RR.....	100	1,000,000	875,000	\$2.50 share, '96.	50	—	Missouri-Edison (St. Louis).....	25	—	—	.....	20	21
Market Street Ry.....	100	18,750,000	18,750,000	Q., 60c. per share.	61 1/2	68 1/2	Eddy Electric Mfg. Co.....	25	—	—	.....	9	12
Presidio & Ferries RR.....	100	1,000,000	550,000	.....	16	—	Hartford (Conn.) Elec. Light Co.	100	850,000	.....	.....	90	19
Scranton Pa. —May 28							Hartford (Conn.) Lt. & Power Co.						
Scranton Railway Co.....	50	6,000,000	2,500,000	.....	29	30	25	175,000	.....	.....	6	10	
Scranton & Carbondale Trac. Co.	100	500,000	500,000	.....	18 1/2	—	New Haven (Conn.) Elec. Lt. Co.	100	100,000	.....	.....	195	—
Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	.....	—	—	Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	.....	2 % Q. Oct.	103	104
Springfield Ill. —May 28							Rhode Island Elec. Protec. Co.						
Springfield Consolidated Ry.....	100	750,000	750,000	.....	—	—	100	—	—	.....	118 1/2	120 1/2	
Springfield O. —May							Royal Elec. Co. (Montreal).....						
Springfield Street Ry.....	100	1,000,000	1,000,000	.....	—	11	100	1,320,000	.....	1 % Q.	120	251	
Springfield, Mass. —May 28							Toronto (Canada) Elec. Light Co.						
Springfield Street Ry.....	100	1,200,000	1,166,700	1 % A.	207	212	100	1,085,000	1,085,000	1 1/2 % Q.	135	138	
Toronto Canada. —May 28							Thomson-Houston Welding Co.						
Toronto Street Ry.....	100	6,000,000	6,000,000	1 1/2 % S.	109 1/2	110 1/2	100	—	—	8 % S. Dec. 1.	100	100	
Montreal Street Railway Co.....	100	4,000,000	4,000,000	4 % S.	279	280	100	—	—	.....	105	106	
Washington, D. C. —May 28							ALLIED INDUSTRIES.						
Belt Ry. Co.....	50	500,000	500,000	.....	—	—	Boston, Mass. —May 28						
Capital Traction Co.....	100	12,000,000	12,000,000	65c. per sh. Oct.	102 1/2	102 1/2	American Electric Heating Co.....	50	10,000,000				

BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

Albany N. Y.

Date of Quotation—May 28, 1901

NAME	Authorized	Issued	Due	Interest	Rate	Asked
The Albany Ry. Co. Cons. mtg. 5s	\$500,000	427,500	1940	J. & J.	117½	.....
The Albany Ry. Co. Gen. mtg. 5s	750,000	750,000	1947	M. & N.	116½	.....
Watervliet Turnpike & RR. 1st mtg. 5s	850,000	850,000	1919	M. & N.	112	.....
Watervliet Turnpike & RR. 2d mtg. 5s	150,000	150,000	1919	M. & N.	112½	.....
Troy City Railway Co. 1st 5s	.....	.....	1942	.....	116	117

Interest guar. by Albany Ry. Co.
[Principal and interest guar. by
Albany Ry. Co.]

Baltimore Md.

Date of Quotation—May 28, 1901

NAME	Authorized	Issued	Due	Interest	Rate	Asked
United Electric Ry. Co. 1st mtg. g. 4s	88,000,000	18,000,000	1949	M. & S.	102	102½
..... Income 4s	14,000,000	.....	1949	J. & D.	74½	75
Baltimore City Pass. Ry. 1st mtg. g. 5s	2,000,000	2,000,000	1911	M. & N.	118½	.....
Baltimore Traction Co. 1st mtg. 5s	1,500,000	1,500,000	1920	M. & N.	119	120
Baltimore Trac. Co. Exten. & Imp. g. 5s	1,250,000	1,250,000	1901	M. & S.	104½	.....
Bal. Trac. Co. No. Balto. div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121½
Baltimore Traction Co. Convertible 5s	750,000	.....	1900	J. & J.	101	.....
Central Pass. Ry. Co. 1st mtg. 5s	800,000	.....	1906	N. & M.	102½	.....
Central Pass. Ry. Co. Cons. mtg. 5s	56,000	117,000	1912	J. & J.	.....	.....
Central Pass. Ry. Co. Cons. mtg. g. 5s	604,000	580,000	1922	M. & N.	119	121
City & Suburban Ry. 1st mtg. g. 5s	8,000,000	8,000,000	1922	J. & D.	116	117
Lake Roland Elev. 1st mtg. 5s	1,000,000	1,000,000	1942	M. & S.	117	.....

All of the bonds of the above
companies, marked †, have been
assumed by the United Railways & Electric
Company.

Boston Mass.

Date of Quotation—May 28, 1901

NAME	Authorized	Issued	Due	Interest	Rate	Asked
Lynn & Boston RR. 1st mtg. g. 5s	5,879,000	3,702,000	1924	J. & D.	114	115
West End Street Ry. Deben. g. 5s	8,000,000	3,000,000	1902	M. & N.	104½	106
West End Street Ry. Deben. g. 4½s	2,000,000	2,000,000	1914	M. & S.	112	.....

†\$1,874,000 in escrow to retire outstanding
bonds of absorbed companies.

Charleston S. C.

Date of Quotation—May 28, 1901

NAME	Authorized	Issued	Due	Interest	Rate	Asked
Enterprise Street RR. 1st mtg. 5s	500,000	.....	1906	J. & J.	.....	.....
Charleston City Ry. 1st mtg. 5s	850,000	47,000	.....	J. & J.	106	.....

†Controlled by Charleston St. Ry. Co.

Chicago Ill.

Date of Quotation—May 28, 1901

NAME	Authorized	Issued	Due	Interest	Rate	Asked
Chicago City Ry. 1st mtg. 4½s	6,000,000	4,619,500	1901	J. & J.	101½	2½
Chicago Passenger Ry. 1st mtg. 5s	400,000	400,000	1908	F. & A.	.....	102
Chicago Passenger Ry. Cons. mtg. 5s	1,000,000	600,000	1920	J. & D.	.....	.....
Chicago & So. Side R. T. 1st mtg. g. 5s	7,500,000	7,500,000	1920	A. & O.	.....	.....
Chicago & So. Side R. T. 2d mtg. g. 5s	1,800,000	750,000	1907	J. & J.	.....	.....
Chicago West Div. Ry. 1st mtg. 4½s	4,040,000	4,040,000	1922	J. & J.	108½	109
Lake Street Elevated RR. 1st mtg. g. 5s	7,574,000	8,781,200	1928	J. & J.	.....	.....
Metrop. W. Side Elev. Ry. 1st mtg. g. 5s	15,000,000	15,000,000	1942	F. & A.	96	98½
North Chicago St. RR. 1st mtg. 5s	8,171,000	8,171,000	1906	J. & J.	106	.....
North Chicago St. RR. Cons. mtg. 5s	800,000	800,000	1911	J. & J.	.....	.....
North Chicago City Ry. 1st mtg. 5s	500,000	500,000	1900	J. & J.	.....	.....
West Chicago St. RR. 1st mtg. 4½s	2,500,000	2,500,000	1927	M. & N.	108	.....
West Chicago St. RR. 2d mtg. 5s	4,100,000	8,969,000	1928	M. & N.	.....	.....
West Chicago St. RR. Deben. 5s	2,700,000	700,000	1911	J. & D.	101	111
W. Chicago St. RR. Cons. mtg. g. 5s	12,500,000	6,000,000	1926	J. & D.	102	107
W. Chicago St. RR. Tunnel. 1st mtg. 5s	1,500,000	1,500,000	1909	F. & A.	.....	.....

†Funded debt assumed by Chicago W.
Div. Ry. Co., controlling interest of
which is owned by W. Chicago St. RR.
Co., lessee.

†Subject to call after Oct. 1, 1899, at
\$110 and interest.

†Assumed by W. Chi. RR. Co., lessee
†Int. guar. by W. Chicago St. RR. Co.

Cincinnati O.

Date of Quotation—May 28, 1901

NAME	Authorized	Issued	Due	Interest	Rate	Asked
Old. New & Cov. St. Ry. 1st Cons. mtg. g. 5s	8,000,000	2,500,000	1922	J. & J.	114½	115
†Mt. Adams & Eden Pk In. 1st mtg. 5s	46,000	46,000	1900	A. & O.	108½	104
†Mt. Adams & Eden Pk In. 2d mtg. 5s	100,000	100,000	1905	A. & O.	114	.....
†Mt. Adams & Eden Pk In. Cons. mtg. 5s	581,090	581,000	1906	M. & S.	108½	.....
So. Cov. & Cin. St. Ry. 1st mtg. 5s	250,000	250,000	1912	M. & S.	121½	122½
So. Cov. & Cin. St. Ry. 2d mtg. 5s	400,000	400,000	1922	J. & J.	122½	127

†Assumed by the Cincinnati St. Ry. Co.
†\$250,000 reserved to retire 1st mtg. bds.

Cleveland O.

Date of Quotation—May 28, 1901

NAME	Authorized	Issued	Due	Interest	Rate	Asked
Brooklyn Street RR. Co. 1st mtg. 5s	600,000	600,000	1908	M. & S.	106½	107
Cin. New & Cov. St. Ry. Cons. mtg. 5s	8,000,000	2,500,000	1922	J. & J.	118½	114½
Cleveland City Cable Ry. 1st mtg. 5s	2,000,000	2,000,000	1909	J. & J.	105½	106
Columbus (O.) Cent. Ry. 1st mtg. g. 5s	8,500,000	1,249,000	1918	M. & S.	106	107
East Cleveland RR. 1st mtg. g. 5s	1,500,000	1,500,000	1912	M. & N.	.....	.....
Fl. Wayne (Ind.) Elec. Ry. 1st mtg. g. 5s	1,000,000	1,000,000	1910	M. & S.	.....	107½
Lorain (O.) Street Ry. 1st mtg. 5s	600,000	.....	1922	M. & N.	.....	.....
St. Ry. Co., Grand Rapids. 1st mtg. 5s	200,000	200,000	1915	J. & J.	.....	.....
†\$1,900,000 in escrow to retire bonds of absorbed companies, marked a.	600,000	600,000	1912	J. & D.	.....	.....

Interest guar. by Cons. St. Ry. Co.

Detroit Mich.

Date of Quotation—May 28, 1901

NAME	Authorized	Issued	Due	Interest	Rate	Asked
Detroit Citizens' St. Ry. 1st mtg. 5s	7,000,000	8,885,000	1905	A. & O.	.....	102½
Fl. Wayne & Belle Isle Ry. 1st mtg. 5s	400,000	877,000	1902	A. & O.	.....	.....
The Detroit Ry. 1st mtg. 5s	1,800,000	1,800,000	1925	J. & D.	105	106½

†\$1,150,000 in escrow to retire bonds of
Det. City Ry. and Grand River St. Ry.

New Haven Conn.

Date of Quotation—May 28, 1901

NAME	Authorized	Issued	Due	Interest	Rate	Asked
New Haven St. Ry. 1st mtg. g. 5s	600,000	600,000	1918	J. & D.	111	.....
New Haven (Edgewood Div.) 1st mtg. 5s	250,000	250,000	1914	J. & D.	111	.....
Winchester Avenue RR. 1st mtg. g. 5s	100,000	100,000	1912	M. & N.	109	.....
W. Chester Avenue RR. Deben. 1. g.	100,000	100,000	1912	M. & S.	.....	.....

*With interest. *Unlisted.

New Orleans La.

Date of Quotation—May 28, 1901

NAME	Authorized	Issued	Due	Interest	Rate	Asked
Canal & Claiborne RR. Cons. mtg. 5s	\$150,000	\$150,000	1921	M. & N.	.....	.....
Crescent City RR. 1st mtg. 5s	.....	50,000	1899	M. & N.	106½	.....
Crescent City RR. Cons. mtg. g. 5s	5,000,000	8,000,000	1941	J. & J.	.....	.....
New Orleans City RR. 1st mtg. 5s	416,500	899,000	1900	J. & D.	108	112
N. Orleans City & Lake RR. 1st mtg. g. 5s	5,000,000	2,599,500	1941	J. & J.	.....	.....
N. Orleans & Carrollton RR. 2d mtg. g. 5s	850,000	850,000	1907	F. & A.	.....	.....
Orleans Railroad Co. Cons. mtg. 5s	800,000	800,000	1911	J. & J.	.....	.....
St. Charles St. RR. Co. 1st mtg. 5s	800,000	75,000	1907	J. & D.	.....	.....

†\$428,500 in escrow to retire New Or.
leans City RR. Co.'s 1st mtg. bonds.
†\$90,000 outstanding.

New York.

Date of Quotation—May 28, 1901

NAME	Authorized	Issued	Due	Interest	Rate	Asked
Atlantic Ave. (Brooklyn) Imp. g. 5s	1,500,000	1,500,000	1904	J. & J.	95	.....
Atlantic Av. (Brooklyn) 1st gen. mtg. 5s	759,000	759,000	1906	M. & S.	107½	110
Atlantic Av. (Brooklyn) Cons. mtg. 5s	8,000,000	1,966,000	1907	A. & O.	115	116
Brooklyn & 7th Ave. 1st cons. mtg. g. 5s	12,500,000	7,650,000	1942	J. & D.	128	128
Broadway & 7th Ave. 1st mtg. 5s	1,500,000	1,500,000	1904	J. & D.	104	105½
Broadway & 7th Ave. 2d mtg. 5s	500,000	500,000	1914	J. & J.	108	110
Broadway Surface. 1st mtg. 5s	1,125,000	1,125,000	1924	J. & J.	115	117
Broadway Surface. 2d mtg. 5s	1,000,000	1,000,000	1908	.....	108	106
Brooklyn City RR. Co. 1st cons. mtg. 5s	6,000,000	6,000,000	1941	J. & J.	116	117
Brooklyn City & Newtown. 1st mtg. 5s	2,000,000	2,000,000	1906	J. & J.	115	116
Brooklyn, Bath & W. E. RR. Gen. mtg. 5s	1,000,000	448,000	1908	J. & J.	101	.....
Brooklyn Heights RR. 1st mtg. 5s	250,000	250,000	1941	A. & O.	104	.....
Brooklyn, Q's Co. & Sub'n. 1st mtg. 5s	8,500,000	8,500,000	1941	J. & J.	112	.....
Brooklyn, Q's Co. & Sub'n. 1st cons. 5s	4,500,000	2,750,000	1941	M. & N.	107	.....
Brooklyn Rapid Transit. 1st mtg. 5s	7,000,000	5,181,000	1940	.....	108½	109½
Bleecker St. & Fulton Ferry RR. 1st mtg. 7s	700,000	700,000	1900	.....	98½	104½
Cent Pk. N. & E. RR. 1st cons. mtg. 4s	1,200,000	1,200,000	1902	J. & D.	107	108
Central Cross-town RR. 1st mtg. 5s	250,000	250,000	1922	M. & N.	125	.....
Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1908	J. & J.	101	108
D. Dock, E. B'd'y & B't'y R. gen. mtg. g. 5s	1,000,000	990,000	1902	J. & D.	117	120
Dry Dock, E. B'd'y & B't'y R. scrip 5 %	100,000	1,100,000	1914	F. & A.	102	105
Eight Av. RR. Co. Cert. Indeb. 6 %	000,000	1,000,000	1914	F. & A.	108	.....
42d St., Man. & St. Nich. Av. 1st mtg. 5s	200,000	1,200,000	1910	M. & S.	116½	117
42d St., Man. & St. N. Av. 2d mtg. 5s	1,500,000	1,500,000	1915	J. & J.	89	.....
Lex. Ave. & Pav. Ferry RR. 1st mtg. inc. 5s	5,000,000	5,000,000	1948	M. & S.	124	125
Metropolitan St. Ry. Co. g. m. cl. tr. g. 5s	12,500,000	12,500,000	1907	F. & A.	120	.....
Second Avenue Ry. Gen. cons. mtg. 5s	1,600,000	1,600,000	1909	M. & N.	120	121
Second Avenue Ry. Cons. mtg. 5s	800,000	800,000	1909	J. & J.	118	109
Steinway Ry. (L. I.) 1st mtg. g. 5s	1,500,000	1,500,000	1922	J. & J.	116	117
South Ferry RR. Co. 1st mtg. 5s	850,000	850,000	1919	.....	110½	113½
Third Avenue RR. 1st mtg. 5s	5,000,000	5,000,000	1907	J. & J.	.....	123½
Twenty-third Street Ry. 1st mtg. 5s	.....	.....	1909	J. & J.	.....	.....
Twenty-third Street Ry. 2d mtg. 5s	150,000	150,000	1906	J. & J.	106	108
Union (Huckleberry) Ry. 1st mtg. 5s	2,000,000	2,000,000	1942	F. & A.	118	116
Westchester Electric RR. 1st mtg. 5s	500,000	500,000	1948	J. & J.	110	114

†\$1,085,000 in escrow to retire gen. mtg.
bonds.

†\$4,850,000 in escrow to retire maturing
obligations.

†\$652,000 in escrow to retire 1st and 2d
mtg. bonds.

†In treasury, \$30,000.

†Guar. by Union Ry. Co.

Toronto Canada.

Date of Quotation—May 28, 1901

NAME	Authorized	Issued	Due	Interest	Rate	Asked
Montreal St. Ry. 1st mtg. 5s	2,500,000	800,000	1908	M. & S.	.....	.....
Toronto St. Ry. 1st mtg. g. 4½s	4,550,000	2,200,000	1921	M. & S.	.....	.....

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bid.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—May 28 1901						
Jefferson Avenue Ry.....1st mtg. 5s.	270,000	270,000	1908	M. & N.	142	113
Lindell Ry. Co.....1st mtg. 5s.	1,800,000	1,500,000	1911	F. & A.	167	148
Missouri RR. Co.....	1,000,000	700,000	1916	M. & S.	105	106
Mount City RR. Co.....1st mtg. 5s.	400,000	800,000	1910	A. & O.	104½	105½
People's RR. Co.....1st mtg. 5s.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 7s.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 5s.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric 1st mtg. 5s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 5s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
St. Louis & Sub. Ry.....1st mtg. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5s.	800,000	800,000	.....	.....	80	84
Southern Electric Ry.....Cons. mtg. 5s.	500,000	500,000	1909	M. & N.	106	108
Taylor Avenue St. Ry.....1st mtg. 5s.	500,000	500,000	1918	J. & J.	116½	117½
Union Depot RR. Co.....1st cons. mtg. 5s.	1,091,000	1,091,000	1900	A. & O.	100	106½
Union Depot RR. Co.....Cons. mtg. 5s.	8,500,000	1,787,000	1918	J. & J.	121	122
†Controlled by St. Louis RR. Co.						
†Controlled by Union Depot RR. Co.						
†Controlled by Lindell RR. Co.						
†\$200,000 in escrow to retire 1st & 2d mtg.						
†\$200,000 in escrow.						
†\$200,000 in escrow to retire 1st mtg. bds.						
San Francisco Cal.						
Date of Quotation—May 28 1901.						
California St. Cable RR.....1st mtg. 5s.	1,000,000	900,000	1915	J. & J.	114	117
Ferries & Cliff House Ry.....1st mtg. 5s.	550,000	550,000	1914	M. & S.	.....	117
Geary St. Park & Ocean RR.....1st mtg. 5s.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. 5s.	8,000,000	8,000,000	1918	J. & J.	126½	.....
Metropolitan Ry. Co.....1st mtg.	200,000	.....	.....	.....	.....	.....
Metropolitan Ry. Co.....1st mtg. 5s.	2,000,000	2,000,000	1918	A. & O.	126½	.....
Omni-bus Cable Co.....1st mtg. 5s.	850,000	850,000	1912	J. & J.	105½	107
Park & Cliff House RR.....1st mtg. 5s.	250,000	250,000	1914	J. & J.	115	.....
Park & Ocean RR.....1st mtg. 5s.	700,000	700,000	1912	M. & S.	.....	125
Powell St. Ry. Co.....1st mtg. 5s.	1,000,000	900,000	1918	M. & N.	.....	.....
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—May 28, 1901						
Belt Ry. Co.....1st mtg. 5s.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 5s.	500,000	500,000	1914	A. & O.	122	.....
Rockington & Soldiers' Home.....1st mtg. 5s.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	.....	.....
†\$50,000 in escrow to retire 1st mtg. bds.						
Miscellaneous.						
Date of Quotation—May 28, 1901						
Bridgeport Traction Co.....1st mtg. 5s.	2,000,000	1,588,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 5s.	5,000,000	3,548,000	1981	F. & A.	118	.....
City of Buffalo (Ind'polis) 1st cons. mtg. 5s.	4,000,000	3,000,000	1988	M. & N.	104	105
Crosstown St. Ry. (Buffalo) 1st mtg. 5s.	8,000,000	2,866,000	1982	M. & N.	112	118
Columbus (O.) St. Ry.....1st cons. g. 5s.	8,000,000	2,261,000	1982	J. & J.	115	.....
Consolidated Traction (N. J.) 1st mtg. 5s.	15,000,000	13,965,000	1988	J. & D.	111½	111½
Consolidated Traction (O.) 1st mtg. 5s.	2,000,000	872,000	1988	J. & D.	115	115½
Crosst'n St. Ry. (Columb., O.) 1st mtg. 5s.	4,000,000	3,800,000	1920	J. & J.	20	.....
Denver City Cable Ry.....1st mtg. 5s.	4,000,000	922,000	1988	A. & O.	80	85
Denver Con. Tram'y Co.....1st cons. mtg. 5s.	4,000,000	4,981,000	1980	J. & J.	119	119½
Louisville (Ky.) Ry.....1st cons. mtg. 5s.	5,000,000	4,050,000	1919	J. & J.	110½	110½
Minneapolis St. Ry. (N. J.) Cons. mtg. 5s.	8,000,000	2,878,000	1928	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.) 2d mtg. 5s.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.) Deb. 5s.	500,000	489,000	1902	F. & A.	.....	.....
Paterson (N. J.) Ry.....Cons. mtg. 5s.	1,250,000	1,000,000	1981	J. & D.	.....	.....
Paterson (N. J.) Ry.....1st mtg. 5s.	8,000,000	2,000,000	1980	A. & O.	.....	.....
Rochester (N. Y.) Ry.....Cons. g. 5s.	5,500,000	4,298,000	1987	.....	105½	106
St. Paul City Ry.....Cons. g. 5s.	1,000,000	1,000,000	1900	.....	108	.....
†\$1,000,000 in escrow to retire 1st and 2d mtg. bds.						
†\$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
†\$750,000 in escrow to retire bonds of C. St. RR. Co.						
†\$87,000 in treasury.						
†\$900,000 res'vd to redeem prior liens.						
†\$620,000 in escrow.						

*With int' res

ELECTRIC LIGHT AND ELECTRICAL MFG. CO'S

Boston, Mass.						
Date of Quotation—May 28, 1901.						
Delaware Gas Lt. Co.....1st m. 5s. g.	800,000	800,000	.....	J. & J.	106	108
Edison Elec. Illuminating Co., Boston.....	2,026,000	8,750,000	1922	Quar.	187	.....
General Electric Co., gold cons. deb. 5s.	10,000,000	.....	.....	.....	116	.....
Pittsburg Pa.						
Date of Quotation—May 28, 1901						
Allegheny County Light Co.....5s.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co., Scrip 5s.	195,570	.....	.....	M. & S.	.....	.....
Miscellaneous. —(May 28 1901.)						
Edison El. Ilg. Co. (N. York) 1st m. 5s.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1998	.....	124	.....
Edison El. Ilg. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122½	124
Edison Elec. Ilg. Co. (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
Edison Electric Light (Philadelphia).....	2,500,000	.....	1987	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. 1st mtg. 5s.	5,176,000	.....	1997	A. & O.	120	122
Kings Co. El. Lt. & Po. Co. pur. money 5s.	8,000,000	.....	.....	F. & A.	102½	.....
Milwaukee El. Ry. & Lt. Co. 1st cons. g. 5s.	5,000,000	.....	.....	.....	.....	.....
United Elec. Light & Power Co. (N. Y.).....	.....	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—May 28 1901.						
American Bell Telephone.....4s.	.....	.....	1908	F. & A.	100½	101
Northern Telephone Co.....5s.	.....	.....	.....	.....	.....	.....
N. Y. & N. J. Tel. & Tel. Co. gen. mtg. 5s.	.....	.....	.....	.....	114	115
Chesapeake & Potomac Tel. Co.....5s.	.....	.....	1911	J. & D.	108	106

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—May 28 1901						
American Electric Heating.....7s.	500,000	500,000	.....	.....	.....	.....
Armstrong & Sims Engine Co.....5s.	.....	.....	.....	.....	.....	.....
Barney & Smith Co.....5s.	.....	.....	1908	J. & J.	106	107
Camden & Smith Co.....5s.	.....	.....	1904	J. & D.	.....	.....
Washington Pump Co.....5s.	75,000	.....	.....	.....	115	120
Collected						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 17@17¼c.; Lake, 17¼@17½c.; casting, 16¼@17c.

The purchase, is reported of the Northern New York Telephone Company by the Hudson River Telephone Company for \$100,000.

The directors of the London and River Plate Bank, Ltd., London have declared a dividend of 8 per cent. for the six months ending March 31.

The stockholders of the Empire City Subway Company, Ltd., of New York have voted to increase the capital stock from \$1,750,000 to \$2,250,000.

Gross earnings of the Massachusetts Electric Companies are said to be showing a steady increase of about 10 per cent. as compared with a year ago.

It is stated that Charles T. Verkes has sold the 25,000 shares of the Chicago Union Traction Company stock to the Blair-Ryan syndicate at a figure much better than was bid by that syndicate when they purchased his other street railway holdings last winter.

The Philadelphia Bell Telephone Company stockholders approved on May 21 the increase in capital stock from \$6,000,000 to \$8,000,000. \$1,000,000 new stock will be issued at once. Stockholders on record Monday have the right to subscribe to 16½ per cent. of present holdings at par until June 18.

The following are quotations for some of the industrial stocks not quoted elsewhere: Electrical Lead Reduction, 3@4; Electric Boat, 16@20; Electric Vehicle, 10@18; Tel. & Tel. Company of America (full paid) 5@6½; Electric Company of America, 9@9½; National Carbon, 15½@16.

A special meeting of the Brooklyn Elevated Railroad will be held June 25 to ratify the lease of the company's property, to the Brooklyn Heights Railroad for 999 years. The lease will include all the property rights and franchises and other privileges of the Brooklyn Union Elevated Railroad, except its franchise to maintain a corporate existence.

Advices from Boston state that the entire \$7,500,000 Erie Telephone notes, representing the loan due January 10, 1902, have been disposed of. Of the \$7,500,000, there was withdrawn at the start, \$1,500,000 for investment; an option on \$1,200,000 or 20 per cent. of the \$6,000,000 was given to certain interests, and \$4,800,000 was offered to the public by a banker's syndicate. The \$4,800,000 have all been sold and the option on \$1,200,000 has been exercised.

The New York "News Bureau" says that a member of a prominent banking house that has been closely identified with the management of the American Telephone and Telegraph Company says that he believes the new stock, shortly to be issued, will not be offered to stockholders at par, but at a price considerably higher—probably at 130, or thereabouts. He also expressed the opinion that an amount of stock equal to that now held in the treasury—about \$38,000,000—will be offered in \$10,000,000 share lots within a comparatively short time after the increase is authorized.

The details for the merger of the Consolidated Traction Company of Pittsburgh with the Philadelphia Company of that city have been practically agreed upon. It is understood that stockholders in the Philadelphia Company will receive par in 5 per cent. bonds and 20 per cent., or \$10 in common and preferred stock of the new company. It is believed that the new company will be incorporated under the laws of New Jersey with a capital of \$40,000,000, the bonds to be secured by depositing in trust the stock of the constituent companies.

The Chicago Union Traction Company has decided not to refund at present the outstanding West Chicago Street Railroad certificates of indebtedness. Arrangements had been under consideration for the refunding of the certificates on a 4½ per cent. basis. They bear 6 per cent. now. Notice was given on March 27 that the certificates would be paid on June 1. The total amount outstanding is \$497,000 and they were issued on December 1, 1894, each of the denomination of \$1,000. The company will wait for a more favorable money market before refunding the issue.

The agreement on consolidation of the New York Gas and Electric Light, Heat and Power Company with the Edison Electric Illuminating Company, of New York was filed with the Secretary of State on May 23. The title of the new corporation is the New York Edison Company and its capital is \$45,300,000, the aggregate of the capital stock of the two companies consolidated. The directors are Anthony N. Brady, Harrison E. Gawtry, Stephen S. Palmer, Thos. E. Murray, Samuel A. Beardsley, Nicholas F. Brady and Lewis B. Gawtry, of New York City.

The terms upon which the shares of the Electric Company of America and the shares of the American Railways Company are to be purchased have been agreed upon and are stated officially as follows: A new company is to be formed with the following capitalization and bonded indebtedness: Common stock, 100,000 shares at \$50 each, \$5,000,000; preferred stock, 50,000 shares at \$50 each, \$2,500,000; bonds, 4 per cent., \$15,000,000. The preferred stock is to be entitled to dividends up to 5 per cent., but the dividends are not to be cumulative. It may be retired at par and it may subsequently be changed for common stock.

The general balance sheet of the Metropolitan Street Railway system of New York as of March 31, 1901, shows: Assets—Cost of road, etc., \$35,360,004; stocks and bonds, \$21,767,398; new construction on leased lines, etc., to be distributed, \$17,210,903; improvements, additions and betterments, \$2,280,598; cash on hand, \$11,528,096; bills receivable, \$662,209; office furniture, \$18,753; total, \$89,002,325. Liabilities—Capital, \$51,987,300; funded debt, \$21,750,000; bills payable, \$1,600,736; interest on funded debt, \$137,525; rentals accrued, \$324,386; dividends unpaid, \$909,748; bond proceeds to credit of Metropolitan Street Railway Company, lessee, Third Avenue construction account, \$9,802,864; open accounts, \$811,694; profit and loss surplus, \$1,642,070.

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EDITORIAL NOTES.

"Electricity's" Educational Series.

With this issue of *ELECTRICITY* the able series of
educational articles by Mr.
R. Max Eaton, which has
been running for the past
seven months, comes to an end. These element-
ary articles have unquestionably met a long
felt want and have proven most acceptable to
workers in the electrical field, as evidenced by
the number of pleasant things that have been
said about them by practical men. Our object
in running this series was as originally stated
to place before central station men matter
that could readily be understood and that
would tend to benefit them in their profession,
and we feel that to a great extent our pur-
pose has been accomplished.

In the very near future we shall give to our
readers a series of articles on the principles of
dynamo design by an authoritative writer,
which should prove of great value to electric-
ians employed in electrical manufacturing
establishments. These articles will be illustrat-
ed and will contain no more mathematics than
is absolutely necessary to explain and deter-
mine the points at issue.

In concluding it might be well to state that
there are a few complete sets of Mr. R. Max
Eaton's Educational Series still on hand, from
November 14 to date, which may be obtained at
the usual subscription price.

* * *

The Passing of the Cable.

The Broadway cable system,
which was built by the Met-
ropolitan Street Railway
Company some nine years
ago, was superseded on the night of May 25-26
by the underground trolley. The feat accom-
plished by the engineers of the above company
was a notable one, as more than fifteen miles
of surface car lines were converted from cable
power to electric power in a little less than
twenty-three hours.

The last cable car to run over the Broadway
tracks on Saturday night, May 25, finished its
last trip at 9 o'clock. The first electric car to
run over the first section, between 15th street
and 54th street, started at 7:40 o'clock on the
night of May 26. In that time all of the old
cables were drawn from the conduits on Broad-
way, Columbus and Lexington avenues, the
stationary machinery in the conduits was re-
moved and the new electric rails were in-

stalled. At 7 o'clock on the night of May 26
the installation of the electric rails in the con-
duits was completed. Then the connection
with the power house was made for a test—
and after that the first car was run out.

On May 27 the electric system was in full
operation and no accidents or trouble worth
speaking about occurred, if the blowing of a
fuse or two is excepted.

In the history of American street railways
no more costly step for the betterment of a
road has been taken than that which the Met-
ropolitan Company has carried into effect. It
cost \$16,000,000 to build the cable system that
was operated in Broadway, Columbus and Lex-
ington avenues. Of that outlay there re-
mains a salvage of \$10,000,000, chiefly in track-
age and real estate. The remainder, according
to Mr. Vreeland, is old scrap. Great as the
cost to the company has been in making this
change, new work in the line of improvement
has been ordered. Seventh avenue is to be
equipped with electricity at once, and the long
delayed Kingsbridge line is to be built this
summer.

The passing of the cable and the adoption of
electricity cannot fail to be duly appreciated
by the public, if for no other reason than the
doing away with the sudden jerk which in-
variably accompanied the starting of a cable car
on Broadway.

* * *

The Edison Electric Storage Battery.

Considerable interest has
been aroused in scientific
circles over the electric
storage battery recently
invented by Thomas A.
Edison. As is well-known the batteries now
generally in use have their limitations, and
although of great value in central station
work leave much to be desired when it comes
to other applications, such as the propelling of
street cars or automobiles. The principal
trouble has been that batteries were not ef-
ficient enough for their weight; they deterio-
rated too rapidly and had to be renewed too
frequently. Furthermore the cost of renewal
both in time and money was by no means in-
significant, which combined with the other
drawbacks practically prohibited their use in
cases where the batteries had to be carried
by the vehicle which they were to propel.

At a meeting of the American Institute of
Electrical Engineers on May 21 in this city Dr.
Arthur E. Kennelly described the Edison Stor-

age battery at considerable length. Realizing that the existing type of battery left much to be desired Mr. Edison, according to the author, set before himself the following five points of excellence which the new battery cell he was to invent must possess: 1. Absence of deterioration by work. 2. Large storage capacity per unit of mass. 3. Capability of being rapidly charged and discharged. 4. Capability of withstanding careless treatment. 5. Inexpensiveness.

All of these advantages are claimed to be possessed by the new battery. The negative pole, or positive element, corresponding to the zinc of a primary cell, or the spongy lead of a secondary cell, is iron. The positive pole or negative element, corresponding to the carbon of a primary cell, or lead peroxide of a secondary cell, is a superoxide of nickel believed to have the formula NiO_2 . The cell is therefore a nickel-iron cell, a name which suggests the structural material—nickel-steel. The electrolyte is potash; viz., an aqueous solution containing from 10 to 40 per cent. by weight, but preferably 20 per cent. of potassium hydroxide, the freezing temperature of which is 20 degrees below zero F. or—30 degrees C.

The advantages of the Edison battery over the modern lead battery are forcibly pointed out by Dr. Kennelly. He says:

"In practice, the storage energy per unit mass of the modern lead battery, is from 4 to 6 watt-hours per pound of battery (8.8 to 13.23 watt-hours per kilogram. Expressed in another way, a battery weighs from 124.5 to 186.5 lbs. per horse-power-hour at its terminals (75.5 to 113.4 kilos per kilowatt-hour); or, if its stored energy available at terminals were all expended in gravitational work, a battery could raise its own weight through a vertical distance of from two to three miles (3.2 to 4.8 kilometers)."

In the Edison battery the storage energy per unit of mass is given as 14 watt-hours per pound of battery, or in other words, the weight of the battery per unit of electric energy at its terminals is 53.3 lbs. per horse-power-hour. Thus it will be seen that the Edison battery will accomplish the same work as the modern lead battery and will weigh only about one-third as much.

The make-up of the new battery is described as follows:

"The positive and negative plates are mechanically alike, and can scarcely be distinguished by the eye. They differ only in the chemical contents of their pockets. Each plate is formed of a comparatively thin sheet of steel, 0.024 inch (0.61 mm.) in thickness, in which rectangular holes are stamped, so as to leave a grid or frame somewhat resembling a window frame. Each opening or recess is filled with a pocket or shallow box containing the active material. These boxes correspond to the panes of glass in the window-frame analogy.

"The positive briquettes (zincs of a primary cell) are made by mixing a finely divided compound of iron obtained by a special chemical process with a nearly equal volume of thin flakes of graphite. The graphite does not enter into any of the chemical actions, but assists the conductivity of the briquettes. The graphite is divided into very thin laminae by a chemical process, and these are passed through sieves or screens so as to leave a size or area of flake that is much larger than the area of the

perforation in the steel windows. The mixture is then pressed into briquettes in a mold, under a hydraulic pressure of about two tons per square inch. The briquettes have a surface area of nearly 3 inches by $\frac{1}{2}$ inch on each face.

"The negative briquettes (carbon of a primary cell) are made by similarly mixing a fine divided compound of nickel, obtained by special chemical means, with a nearly equal bulk of fine flakes of graphite, and solidifying the mixture in a mold into briquettes of the same size as above."

Referring to the action on the briquettes of the current in charging and discharging the author says:

"The action of the charging and discharging current upon the briquettes seems to be transferred from their external surfaces inwards in a manner similar to the transfer of carbon and oxygen in the process of making malleable cast-iron in the furnace on the principle of cementation. No active material has been found to be ejected from the briquettes through the window perforations, even under the deliberate overcharging and discharging. Such gas as is thereby produced makes its appearance on the external surface of the windows."

The batteries, according to Mr. Edison, can be manufactured and sold at a price per kilowatt hour not greater than the prevailing price of lead cells, which would seem to indicate that there may possibly in the near future be a boom in storage battery cars and in electric automobiles.

* * *

Electricity in Japan.

The use of electricity for lighting purposes is spreading in Japan, and it is now not uncommon to find electric lights displayed in Japanese shops and in front of and inside the dwellings of the better classes. The principal importation of apparatus and supplies is made from the United States, and they are much preferred to those manufactured for that market in Great Britain and Germany. This information has been obtained from Japanese electric light companies themselves. The total values of these imports in 1899 was \$218,100, of which the United States sent \$129,707 worth.

Two years ago the United States stood at the foot of the list in the exportation of telegraph wire to Japan, but now this country stands nearly at the head. Throughout 1899, the United States led in exports of electric light wire to the Japanese market, as in 1897. In 1898, Great Britain had a slight advantage in this respect.

The value of telephones imported into Japan fluctuates widely every year. The United States remains the chief exporter, and in 1899 sent \$51,567 worth against \$18,595 in 1898. During 1897, the American export was \$118,767. Great Britain and Belgium are competing in a small way.

The steamer Lake Champlain, which arrived in Halifax, N. S., last week was fitted with the Marconi wireless telegraph apparatus, and Prof. Stacey, a passenger, made a practical test of the Marconi system. He says that on leaving England he communicated with Marconi stations at Holyhead and Rosslare, Wexford, Ireland, from a distance of about fifty miles. Several messages were sent. On the return passage other tests will be made.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

MR. C. P. STEINMETZ of the General Electric Company has presented to the electrical engineering laboratory of Union College, Schenectady, N. Y., several hundred dollars' worth of apparatus, consisting of a one-half horse power three-phase induction motor, a three-phase rotary converter, a three-phase variable ratio transformer, besides several minor pieces of apparatus. The electrical engineering laboratory has been the recipient of several gifts of a similar nature during the year and students in this department fully appreciate their favors.

A CABLE dispatch from Buenos Ayres, S. A., states that Señor Ricaldoni, an engineer, has made experiments with an improved system of wireless telegraphy. The results of the experiment were very satisfactory. Señor Ricaldoni will soon try a submarine boat of his invention.

THE local committee has arranged the programme for the coming convention of the Canadian Electrical Association to be held at Ottawa. The dates are June 19, 20 and 21. The meetings will be held in the reading room of the Russell House. On the first day, Mayor Morris will extend a civic welcome, and the visiting delegates will be driven about the capital. Visits will also be paid to various points of interest. On the evening of June 20 the annual banquet is to be held in the Russell House. During their stay the delegates will be given a trip to Rockcliffe and the rifle range, and to Britannia-on-the-Bay, over the O. E. Railway suburban line, and to Aylmer and Queen's Park on the Hull electric line. A visit will also be paid the Metropolitan Electrical Company's works at Britannia, and the plants of the Hull Electric Company and Capital Power Company at Deschenes. Special attention is to be paid to the electric plants at and about the Chaudiere. On the list of papers to be read at the convention is one entitled "Dominion Electrical Standards," by O. Higman.

A LIEUTENANT in the Russian navy has invented an electric submarine boat which the Imperial Government regards as of excellent promise. The boat is now under construction at Cronstadt and will be ready for practical tests in another month. It is being built under the supervision of M. Kuteinkoff, a prominent naval engineer.

ACCORDING to a persistent cable rumor from Paris the French Thomson-Houston Electric Company is about to become the controlling force in a big transportation monopoly, including all the Paris omnibus and tramway lines as well as the Metropolitan Underground Railway. The Thomson-Houston Company, it is declared, has just bought 3,000 shares of the General Omnibus Company, and has also made a deal with the Metropolitan by which it obtains a large financial interest in that concern. An article in the Paris "Presse" declares that the Thomson-Houston Company has been working a long time to acquire a majority of the shares of the traction companies of Paris, in order to gain control of them, whereupon all other electric competition will be shut out. The "Presse" also says: "This cursed trust idea has come to us by way of New York and

London. It surely has not been a sufficient success in those cities to warrant us in allowing it to invade Paris." The Thomson-Houston Company is mainly engaged in furnishing material to the French electric transportation companies, often accepting as payment stock in the new companies. It is understood that in this way the Thomson-Houston people have acquired a powerful voice in Parisian traction affairs.

THE electric town of Shawinigan Falls, Quebec, which had a population of one dozen people, two years ago, is now a municipality of 4,000 people, all owing to the generation of electric energy there. The town is laid out precisely like the city of New York, bounded on two sides by a river. So far, the chief industries are the Shawinigan Water & Power Company, having at present a capacity of 25,000 hp. with capabilities of developing 100,000 hp., the Pittsburg Reduction Co., the great pulp factory being constructed by the Belgo Pulp & Paper Company, the Calcium Carbide Works, large brick works and a cotton mill about to be constructed. All these industries are the outcome of electric power development.

THE contestants in the Paris-Bordeaux and James Gordon Bennett automobile races started about 4 o'clock on the morning of May 29. There were only three competitors for the Bennett Cup, Charron, Levegh and Girardot, and eighty-nine entries for both races. The distance was 345 miles. The cup competitors used motors of from 40 to 48 hp. Fournier, the first competitor to arrive at Bordeaux, piloted a Morss motor and made the run in 8 hours 44 minutes and 44 3-5 seconds. Farman was second, in a Panhard motor, and occupied 9 hours and 14 minutes, while Vogt, who was third, in a Panhard motor, covered the distance in 9 hours 40 minutes and 11 seconds. Girardot, who arrived eighth among the contestants, won the James Gordon Bennett Cup. He covered the distance in 11 hours and 44 minutes.

ELECTRIC automobiles are manufactured in Toronto, Ont., and exported to England.

THE development of mineral regions in Arizona by electricity is the latest event of importance in the mineral fields of that section and a subject which is being generally talked about. San Francisco capital is first to undertake the ambitious scheme of supplying the machinery and camps of an extensive mineral belt in Arizona with electricity for power. Chas. M. Clark, who is at the head of the enterprise, has received a report from a San Francisco engineer favorable to the enterprise. According to the plans an electric plant will be established on the Salt River about 20 miles from Globe at the junction of Cherry Creek and the wires will be strung first to Globe and then through the Mineral Creek district reaching, after passing through the Black Warrior mines, the camps of Kelvin, Ray and Troy and a number of mining properties in that region. The engineer states in his report that the waters of the Salt River at any season are capable of moving machinery that will generate more than 3,000 hp.

A CHICAGO paper states that a new third rail electrical invention has been perfected by E. W. Farnham, industrial commissioner of the Chicago, Burlington & Quincy Railroad,

which promises to solve the problem of operating surface lines. Tests made in the presence of W. J. Murphy, vice-president of the Queen & Crescent road; B. R. Noble, president of seven Michigan banks, and other capitalists and railroad men, show the device to be a success. It is claimed the invention can be applied to cable lines, and that one power-house will be sufficient for at least 150 miles of road. The mechanical construction of the third rail is along the lines of the practical action of a soft iron shoe plate when pressed against a revolving chilled or steel car wheel. The current is introduced to the rail and thence to the motor through the shoe plates. The Third-Rail Construction Company, with a capital stock of \$3,500,000, has been incorporated to push the invention.

THE "Moniteur Scientifique" in a recent issue refers to the manufacture of glass by means of electricity. The materials in fine powder are fed into an electric furnace in several compartments; in about twenty minutes a clear liquid glass is obtained, which can be run into molds or worked as usual. For the finer kinds of glass the compartments are placed over one another, as the refining takes place more quietly. Fifty volts are sufficient with the Becker furnace, and the current can be either alternating or continuous. It is claimed as an advantage that the furnace can be easily started or stopped within a short time, and that the expense of pots will be saved. The trials are being made by a company at Cologne.

ABOUT fifty men were put to work in the Crocker-Wheeler Company's works, at Ampere, N. J., Monday morning, and all day the plant was patrolled by forty-seven armed private detectives, who kept the striking machinists from interfering with the men. The company has provided cooks, waiters, and a kitchen, and cots for the workers, and says it will board them for a year if the strike lasts that long. Plenty of reading matter has also been furnished to them and other entertainment is promised.

A CABLE dispatch states that one of Mr. Marconi's latest experiments is the adaptation of his system of wireless telegraphy to the automobile. While bowling along the country roads of Dorsetshire he sent messages from his motor carriage to Ventnor, in the Isle of Wight, thirty miles away, over the Solent and chalk cliffs, and ordered his lunch at the hotel at Poole, whither he was bound. This is a peaceful possibility of the invention. The first automobiles to which the wireless telegraphic apparatus has been attached are intended for war. Cars thus fitted, says the London "King," are to be used in the forthcoming military manoeuvres.

AN electric car has been built for General Manager George B. McCullough of the Union Traction Company of Indiana at a cost of \$12,000. The car is 60 feet long and at either end is a fender, resembling a locomotive cowcatcher. It is equipped with an electric brake. The interior contains two apartments—one known as the "red room," and is finished in mahogany and red, with a blue ceiling, and is fitted with a desk and writing table. It was designed as a combination smoking room and office. The other is the

"green room," which, besides being fitted with berths, may be used as a dining room. Adjoining this apartment is the bath, buffet and kitchen. Aside from the magnificence of the structure, it is a model of car building. It is designed to attain a speed of 50 miles an hour. The tracks of the Union Traction Company parallel those of the Big Four for many miles, and the competition forces the electric company to maintain a high rate of speed.

THE N. Y. "Tribune" says: Both in England and Germany schemes are on foot to run electric trains at a speed of almost 100 miles an hour and to charge low fares on these wonderful "flyers." When a railroad of that sort is built across New Jersey the temptation to Philadelphians to remove their business offices, their banks, corporations, mills and stores to New York may prove irresistible. They can get a peaceful night's rest in their beloved homes, and can come to the metropolis every morning to make money after they have enjoyed their favorite breakfasts of scrapple, catfish and waffles, and can return every evening in time for dinner. To sleep in Philadelphia every night in the week and to make money in New York six days out of seven—what an ideal existence!

MAYOR VAN WYCK of New York has signed the resolution of the Municipal Assembly providing for a Rapid Transit tunnel between the boroughs of Manhattan and Brooklyn.

FRANK L. WEAN, Special Master in Chancery, has filed in the United States Circuit Court, Chicago, his report on the Peoria electrolysis case. He recommends that an injunction be issued restraining the Peoria electric car lines from operating their cars by the single trolley system. The reason given by Master Wean for recommending an injunction is that the underground water mains in the city of Peoria are being destroyed under the influence of the electric current which escapes from the tracks of the trolley lines.

PRESIDENT MCKINLEY, in his speech at San Francisco May 18, on the occasion of the launching of the battleship Ohio, said: "There is nothing in the world that brings people so close together as commerce. . . . The nations are close together now. The powers of the earth are tied together. We have overcome distance. We not only want a commercial line, but we want a cable line from here to the Philippines. We want it to be an American cable that cannot be cut by any power in the world. It is said trade follows the flag. The telegraph must follow trade."

A NOVEL and most useful contrivance of an electric lamp for use especially in reading meters is the invention of Mr. Oster, of Urdingden, says the "Electrical Engineer," London. As usual in this class of lamp, the accumulator is carried in the pocket, but the lamp in question is so made as to allow of its being carried in the mouth. A squeeze with the teeth sets it in action, with the obvious advantage that both hands are left entirely free.

MR. CLINTON L. ROSSITER, late president of the Brooklyn Rapid Transit Company, says he will soon accept the presidency of a new million-dollar trust company of Brooklyn.

THE MERCURY PROCESSES FOR THE PRODUCTION OF CAUSTIC ALKALIES AND CHLORINE.

BY JOHN B. C. KERSHAW, F. I. C.,
London.

Processes for the manufacture of alkalis and chlorine by the electrolytic method may be divided into two broad classes, namely, diaphragm and non-diaphragm processes.

The greater number of processes of the latter type make use of mercury or a fused metal for separating the sodium from the electrolyte, and in the present article the writer proposes to give some details concerning the present position of the non-diaphragm mercury processes.

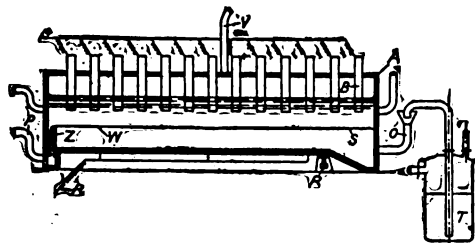


FIG. 1.

The Castner cell, which is one of the most successful of the cells based on this principle, has often been dealt with in the technical press, and it would probably be superfluous to give, at this late date, any detailed description of the cell. It will suffice to say that it differs from other mercury cells in the method of withdrawing the mercury when charged with sodium from the cathode compartment of the cell, and in submitting this sodium amalgam to the action of water. In the Castner cell this withdrawal is effected by a mechanical rocking movement of the cell; while in other types of mercury cell the transfer is brought about by different methods of utilizing the force of gravity.

The Castner cell is in operation at Weston Point in England, at Osternienberg in Germany, and at Niagara Falls in America.

The Weston Point Works commenced to operate with 1,000 hp. in 1898 and have now reached their full capacity of 4,000 hp. It is not intended to add to the plant at present.

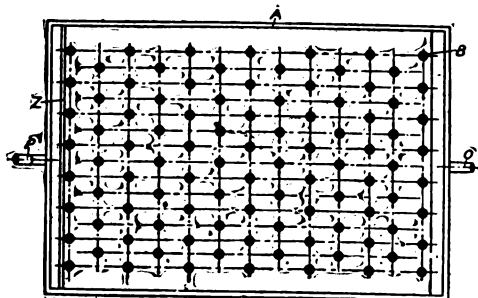


FIG. 2.

The output of this works is estimated to be about 6,000 tons, 70 per cent. caustic soda, and 13,000 tons, 35 per cent. bleaching powder per annum. Recently the manufacture of metallic sodium by the Castner process has been commenced at Weston Point.

The view given of this works shows that in the early days of the manufacture no harmful effects could be observed upon the crops in the neighborhood, but it is probable that in time it will be more difficult to raise "bumper crops" of oats close to the boundaries of the works.

At Osternienberg, in Germany, the German

Solvay Company have been operating the Castner cell since 1896 with 1,500 hp.; and at Niagara the same cell has been working since 1898 by the Mathieson-Alkali Company. Until recently a 2,000 hp. plant had been operated at the latter place, but towards the end of last year a new company, the "Castner Electrolytic Alkali Company" was formed, and the works at Niagara are now being extended to utilize 6,000 hp. The whole of these extensions are expected to be completed during the current year, and the Electrolytic Alkali Works at Niagara will then be the largest works of this kind in existence.

All the Castner cell alkali companies have hitherto been financially successful, and the English company is paying its ordinary shareholders 8 per cent. upon the capital invested.

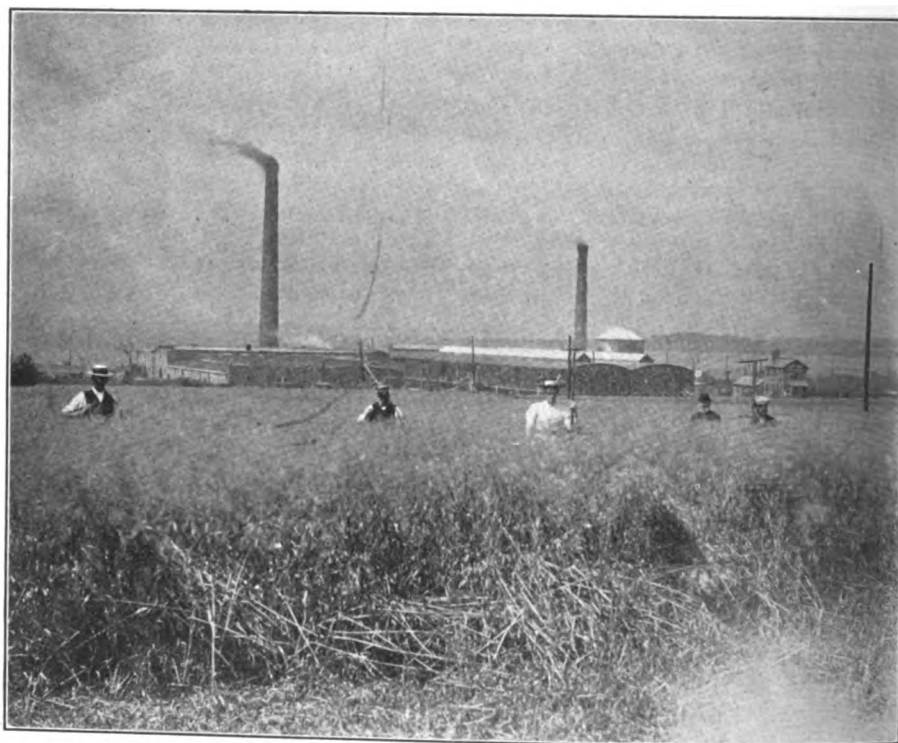
A modification of the Castner cell has been patented by Solvay & Co. of Brussels, and this improved mercury cell is now operated at Jemeppe in Belgium, and at Donetz in Russia, by sub-companies founded by the Brussels firm.

decomposed. The cell is provided further with inlet and exit pipes for the brine, the flow of which through the cell is in the same direction as the mercury, and also with an outlet (V) for the chlorine gas, generated at the anodes. A pump is required with this type of cell in order to circulate the mercury, but it is claimed that many advantages compensate for this addition to the cost of operating the cell. These advantages are:

1. The cells can be constructed of any size, since no mechanical motion is required.
2. The flow of mercury can be adapted to the current passing through the cell, and can be increased or diminished as desired.

3. The concentration of the amalgam can if requisite be allowed to proceed until a solid crust is formed, without any hindrance to the proper operation of the cell; for this solid crust passes away over the weir (Z) without difficulty.

That the Solvay Company is satisfied with this form of cell is proved by its adoption for their new works at Jemeppe and at Donetz, in



VIEW 1.—THE CASTNER-KELLNER ALKALI WORKS, ENGLAND.

The Solvay cell may be explained by aid of Figs. 1 and 2, which show the cell in sectional elevation and in sectional plan.

The principle of the cell is based upon the fact that the amalgam of sodium and mercury is lighter than the pure mercury and floats upon its surface. By making use of a cell provided at one end with a bridge or weir it is therefore possible to float off the amalgam, while retaining the heavier pure mercury on the floor of the cell.

The cell is built of any suitable material and is rectangular in form. It is closed, above, and is provided with a large number of carbon anodes (B) which hang in the concentrated salt solution used as electrolyte. An opening (O) at one end allows fresh mercury to be continually pumped into the cell, thus raising the level of the pool of mercury on the floor of the cell which forms the cathode (S W), and causing the amalgam floating on the surface to pass away over the weir (Z) to the decomposing chamber where it is treated with water and

place of the Castner cell, although they hold the European patent rights for the latter.

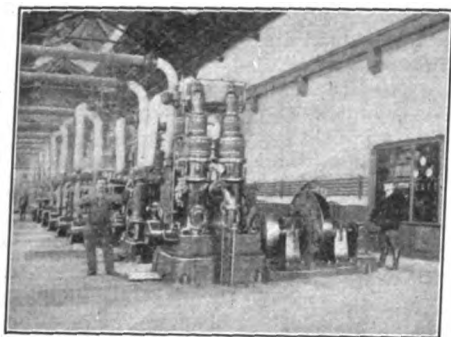
The works at Jemeppe and Donetz each utilize 1,500 hp. and are estimated to produce each about 6,000 tons caustic alkali and bleach per annum.

The steam-generating plant at Jemeppe is shown in View 2.

The third mercury process in actual operation is that used by the various works now under the control of the "Elektron" Company of Griesheim, near Frankfort, the pioneer company in these new developments of the alkali industry.

At one time it was stated that the process worked out in 1888-1890 by this firm, was a diaphragm process, but according to later information the process now worked is of the non-diaphragm mercury type, and probably it only differs in minor details of cell construction from the Castner and Solvay processes. As the "Elektron" Company refuses to give any information concerning the process used,

and as no patents have been taken out by this company, nothing definite can be said upon this point. Since the amalgamation of the Griesheim & Bitterfeld interests in 1899, the factories at the following places have passed under the control of the Griesheim Company: Rheinfelden, Bitterfeld, Bozel, Lamotte, Monthey, Zombkowitz, Slaviansk, and Flix in Spain. The total power available in these electrochemical factories is about, 19,000 hp. but it is unlikely that the whole of this is yet being



VIEW 2.—THE SOLVAY ALKALI WORKS, JEMEPPE, BELGIUM.

utilized for the production of caustic soda and bleach.

In addition to the places named above, the "Elektron" process is also being operated at Ludwigshafen and at West-Eregeln in Germany, by independent companies.

Limit of space forbids any detailed account of the Rhodin process, large works for the operation of which are now being built at Sault Ste. Marie in America, or of the interesting forms of mercury cell devised by Crudo & Bissizza, by Kynaston, and by Franke. The three last are still in the experimental stages of their development. At some future date the writer may present details of these, and of the Rhodin mercury cell, to readers of *ELECTRICITY*.

NOTES ON THE USE OF THE DIFFERENTIAL GALVANOMETER.*

BY C. W. S. CRAWLEY.

I do not wish to suggest that I am bringing forward anything new, but rather to say a few words in favor of an old but very effective instrument which has fallen into disuse, and to show a practical way of using it for modern work. In early days the differential galvanometer was used a great deal; when the bridge came into general use it was shelved, as the scope of the bridge was so much greater, and it sufficed for all the resistance measurements then required. Another reason why the differential galvanometer went out was, I think, this: People were used to the old pattern of differential galvanometer with pivoted needle, which was adjusted once for all and remained right. Then the reflecting galvanometer became universal, and the reflecting differential galvanometer when adjusted does not remain right for good, but must be very carefully leveled, and even then is seldom in perfect adjustment. Some year or two ago I wanted some low resistances adjusted which it was impossible to bridge, and so I looked into the potentiometer, which was better, but very troublesome, and this brought me to the differential galvanometer. For I always look on the differential galvanometer as a po-

tentiometer; only, instead of balancing opposing EMF.'s one balances the EMF.'s caused by them.

Now, I know by sad experience that to add just a differential galvanometer was a very great nuisance, so I took the bull by the horns and did not adjust at all, but simply had the galvanometer coils wound double—i.e., with twin wire, and set the instrument up as it was, without adjustment.

In Fig. 1, *a* and *b*, 100 ohms each, are the circuits of the differential galvanometer in parallel, opposed, joined to the battery. In the circuit of *a* is an 0.1 ohm resistance, which can be cut out by a key, and also a slide-wire resistance, *S*, of about 1.5 ohms. In circuit with *b* is

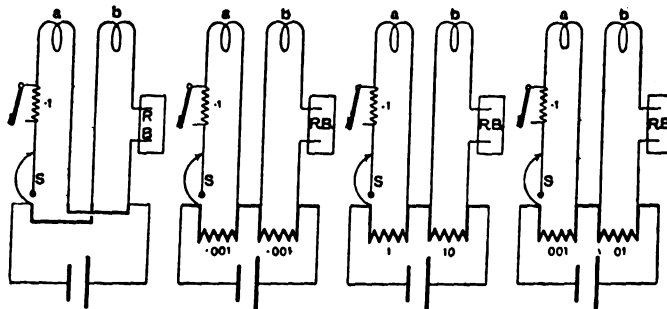


FIG. 1.

FIG. 2.

FIG. 3.

FIG. 4.

enough resistance to about balance. This can be a resistance box. When joined, as shown, if *a* or *b* predominates and gives a deflection, sufficient resistance is added or subtracted by the slide-wire till the spot roughly comes to zero. Now depress the 0.1 key; this disturbs the balance by 0.1 per cent. and causes a deflection of some hundreds of scale divisions. If we do not want to read closer than 0.01 we need not adjust the balance closer than, say, 10 scale divisions.

We now know that two equal and opposite EMF.'s at the terminals of the two-coil circuits will balance, so that we can compare any two equal coils with great ease and great accuracy. For example, two 0.001 ohm coils, as in Fig. 2.

and allowing for it, or setting to an odd ratio; but this is more troublesome.

Now, as to sensitiveness. With 0.1 volt at the terminals of coils short on to the galvanometer and a 10 second swing, we have a deflection of 450 scale divisions for a difference of 0.1 per cent., so that we can compare two 10^{-6} ohm resistances with only 10 amperes, and have a deflection of 4.5 scale divisions for 0.01 per cent.

As to limits of accuracy and sources of error, the galvanometer can be balanced far beyond anything required. Next the question of perfect contacts; they can certainly be counted on not to be more than one one-thousandth ohm if made rationally, or an error of 0.001

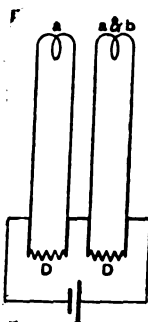


FIG. 5.

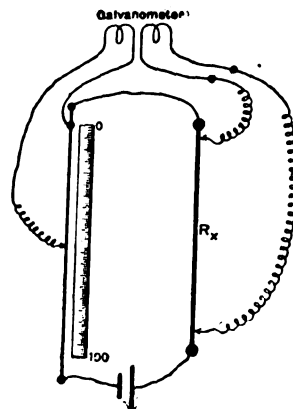


FIG. 6.

If they are not alike there is a deflection. Pressing the 0.1 ohm key gives the deflection for 0.1 per cent. difference between them, which, with only 10 amperes through them, is about 400 scale divisions, so when working to 0.01 per cent. anything under, say, 10 scale divisions can be ignored (which is a great comfort when adjusting).

But we can go a great deal farther; we can join up on to the terminals of a 1 ohm and a 10 ohm standard coil, as in Fig. 3, and add resistance to *b* circuit till a balance is obtained. For all-round work an ordinary resistance-box will do, but if there is much 10 to 1 work to be done it is sometimes worth having a separate coil of

per cent. As to temperature, the galvanometer coils are copper, but being wound double remain always at the same temperature. Thermal contacts may occur at times, but are easily detected and eliminated by reversing the battery current. They are infrequent and small in effect.

For long and continuous testing, especially with a ratio, I like to have a rocking mercury switch which will do the check instantly. When working with ratios, temperature may cause an error; but if the galvanometer is placed so that its temperature remains constant, as shown by a thermometer, the error will not exceed 0.02 per cent. A check should

*Paper read before the Institution of Electrical Engineers, London, April 18, 1901.

be made at the end of the test. In setting it is, of course, necessary to allow for errors in the standards, if they would be within the limits required. It is easily done by deflection. There is only one inherent error to allow for. That is due to the resistance of the coil circuits of the galvanometer not being exactly the same when they are in balance. This, however, is but small. If the coils differ by a per cent. and they are b times the resistance of the coils under test, the error in the result is a/b per cent. a should be under 1, and b is generally at least 100, so that at worst the error is 0.01 per cent., even when comparing 1 ohm coils or setting 1 to 10 ratio with 1 ohm to 10 ohm coils.*

I designed a potentiometer some time ago to get rid of a slide-wire, and it is used a good deal now. There are two dials, one of about 16 ohms, divided into 150 equal parts, and the other, the whole of which is equal to one coil of the first dial, and divided into 100 parts, thus giving the equivalent of a slide-wire divided accurately into 15,000 parts, which is ample for practical work, and which cannot be damaged by its natural enemies—wear, pupils or students. It can also be speedily checked, right through, against itself. Now, just think of the labor of adjusting the 150 contacts of about 0.1 each, and still worse, the 100 contacts of about 0.001 each by potentiometer or other such means. But by differential galvanometer it is perfectly simple; and the result can be easily checked, as pointed out before, by setting the galvanometer 2 or 3 or 10 to 1 instead of level.

Another use of the differential galvanometer method is shown diagrammatically in Fig. 6. It is a workshop method of measuring anything between 0.1 and 0.01, or even less. In the diagram there is a slide-wire of 0.1 total in series with the resistance under test and a battery. One coil of a differential galvanometer is applied to the ends of the resistance R by means of stabbers on cords; the other coil is joined to one end of the slide-wire and to the sliding contact, so that it takes the fall over more or less of the wire, the whole length of the wire being divided into 1,000 parts by a scale; each division (about 1 mm.) is equal to 0.0001 ohm. The wire is about 0.1 inch diameter, so wear does not come in. It works well with 5 A.

In conclusion, I do not suggest the differential galvanometer for ordinary accurate coil work; the Carey-Foster method is perfect for that, and I have never sanctioned any accurate coils between 1 and 10,000 being finally tested by any other method. But below 1 ohm it is invaluable, and it makes quite easy a good

*Let the two coil circuits be so adjusted by resistance that in parallel they give no deflection. Then equal EMF.'s, at their terminals, always give none. Now join to the terminals of two equal coils, D , in series (Fig. 5). If the galvanometer circuits are of equal resistance there will be no deflection. But if they are not, but are a and $a+b$ respectively, the EMF.'s on them will be proportional to the joint resistances, and there will be a deflection due to the difference of EMF. on the two. The joint resistances are:

$$R_1 = ad/(a+d) \text{ and } R_2 = (a+b)d/(a+b+d).$$

Let $b = a/p$ and $d = a/q$; substitute, and we get $R_1/R_2 = 1 + 1/(p+q+pq)$; p and q are large—at least 100; so that error is practically $1/pq$, i.e., if the coil circuits differ by C per cent. the error in the result is C/P per cent., which is of the order of 0.01 at most, and can be easily allowed for in setting.

deal of special work which would not be practical commercially by any other method. For example, the conductivity of two copper bars can be compared with quite reasonable currents, say 10 amperes for bars 1 inch square, which gives about four scale divisions for 0.1 per cent. with contact points 12 inches apart.

THE MODERN SEARCHLIGHT IN THE NAVY.

BY FRANK C. PERKINS.

The searchlight on the man-of-war has come to be considered one of the most important of the ship's equipment and since the use of electricity has become so general special attention has been paid to this class of apparatus.

There has been considerable discussion as to the desirability of using the searchlight for revealing an approaching enemy on account of at the same time making a better mark of

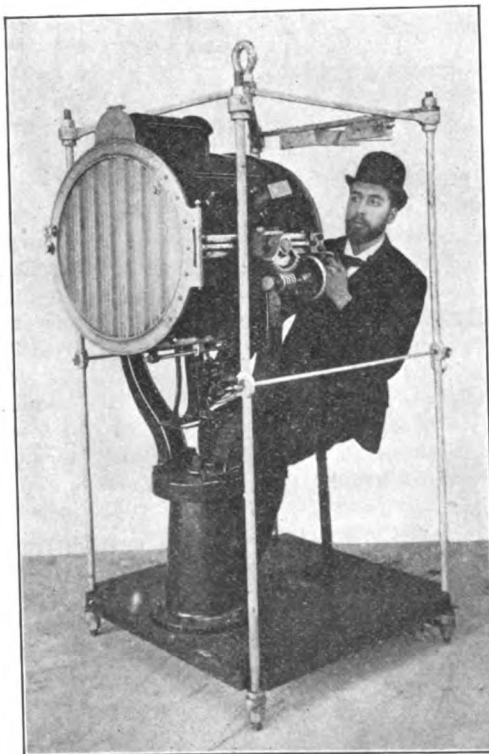


FIG. 1.

Electric Searchlight and Case for use on Ship's Mast.

the ship itself. It is generally conceded, however, that in case of a fleet attacked by a number of torpedo boats, the proper action is to turn all searchlights on, and repel the attack by a liberal use of shot and shell.

It is much easier for the torpedo boat to distinguish the outlines of a large gun-boat than it is to locate these small craft by means of the searchlight sufficiently to insure a good marksman a sure hit. The modern searchlights are located at various points on the battleship, at the fighting tops as well as on the decks.

The illustration, Fig. 1, shows a hand feed operated electric searchlight and cage built by J. H. Holmes & Co., of Newcastle-on-Tyne, England, for use on a ship's mast.

In order to get the best results from the aiming and firing standpoint of the gunner it is necessary to place the searchlight as far away from the gunner as possible and, preferable as far above the deck guns as possible, and while this really aids the enemy to a certain extent, by revealing it to the enemy's torpedoes

and guns, it gives the gunners on the deck below a better opportunity for good work.

The position of searchlights on a battleship is of great importance, and each one is located according to the class of work it is to perform. Those on the lower decks near the water line while of great value in destroying the vision of the occupants of the attacking boats do not greatly aid the gunners, who find it almost impossible to fire accurately and note a target definitely through a strong beam of light. It is claimed to be far easier to operate the guns from points below the light while very difficult to fire from above the searchlights.

Operators working the projectors find it very difficult to see the object sought, on account of being so near the beam of light that his line of vision enters ahead of the advancing boat.

It is of great interest to note the methods of operating searchlights from a distance by electrical control entirely. This allows the operator to remain a considerable distance from the light, thus being better able to make the necessary observations and direct the course of the beam of light to better advantage. The first requisite of such a searchlight is to have an automatic feeding focusing arc light mechanism. Such automatic lamps are shown in illustrations, Figs. 2 and 3, the former showing the vertical carbons with the connections to the feeding mechanisms, while the latter shows the G. E. 90° automatic lamp for searchlights. In order to properly control the searchlight electric motors are used, one to turn and one to elevate the projector barrel, with focusing lamps and reflector. Such a mechanism is shown in the accompanying drawing, Fig. 4, of a Siemens searchlight operated by a switch, which controls both motors by turning to the right or left or up and down exactly as if moving the searchlight by the handle. The light can be stopped at any desired position and the current to the arc lamp is controlled from the same point.

On ship board, the two kinds of searchlights required, are, first, the one for intense illumination of an object in the far distance, and second, one for illuminating a wide belt at a moderate distance. For the first purpose the lights should be placed high up; for the latter, when it is a question of detecting and following up torpedoes, near the water line. In many cases it is not convenient to have long and short range projectors. Schuckert & Co., of Nürnberg Germany, have provided their searchlights with double dispensers, two systems of cylindrical lenses, whose distance apart can be adjusted, and the light thus concentrated in a parallel beam or dispersed to form a cone of 45 degrees.

The diameter of the mirror varies from 450 mm. to 1,500 mm. while the positive and negative carbons of the focusing lamps range from 15.25 mm. to 38 mm. The current used is usually from 25 amperes to 60 amperes, but in some cases, in the largest searchlights, reaches 150 amperes. The searchlights weigh from 180 to 1,350 kilograms without electric motors, while the Schuckert projectors with motors range in weight from 250 to 1,400 kilograms. The searchlight built by Schuckert, shown in Fig. 5, has a mirror 60 centimeters in diameter.

The two terminals are fixed to the stationary base, B. From the binding screws, cables lead to the copper spring brushes, insulated upon the top plate of the base, and bearing against two concentric contact rings attached

to the bottom of the revolving base, C. The binding screws, D, connected with these rings, and elastic cables take the current to the terminals of the focusing lamp. In the projector case, which is a well ventilated drum of sheet-iron, the lamp is supported by two longitudinal bars parallel to the axis of the case. The lamp can be moved backward or forward by means of the hand wheel, 5. The whole projector turns in its cradle which revolves with the base, C. This movement of the case about its horizontal axis, raises and lowers the beam of light, while the revolution of the whole projector, apart from its stationary base about its vertical axis, is effected in a similar manner. The movement of the case on the horizontal axis may be made by hand wheel, 3, through

parallel beam is produced. When the arc is not in the focus a light cone of an angle of 10 degrees can be obtained. The exact centering of the carbons is a matter of great importance,

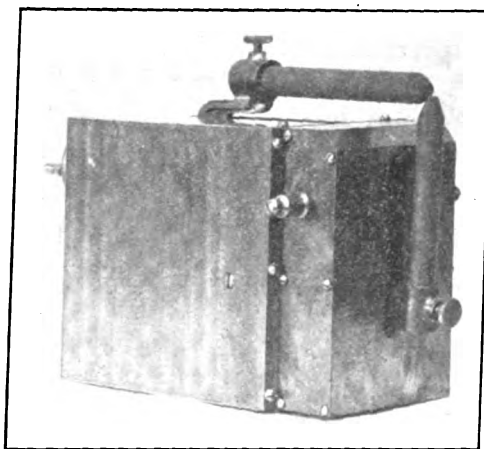


FIG. 3.
G. E. 90° Automatic Searchlight Lamp.

therefore dark colored glass windows have been provided on both sides of the shell, to see whether the carbons are in the same horizontal plane. For adjustment and focusing, a little mirror, T, has been placed in the top of the drum near, A, the mirror throwing an image of the arc on the lateral window, W. The window is made of ground glass, and a wire is stretched behind it; when the image of

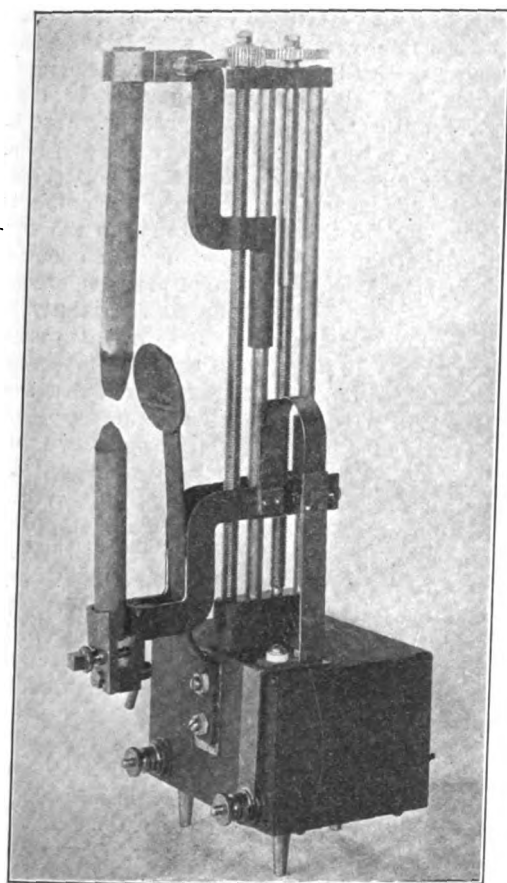


FIG. 2.
G. E. Searchlight Automatic Lamp.

worm gear 2 or by means of the electric motor, HM. The movement of the projector on its vertical axis may also be obtained by use of a hand wheel or by means of the electric motor VM, hidden from view. The parabolic glass mirror is backed with silver, embedded in asbestos and mounted in a collar, in which it is fixed by means of a large number of brass straps bent at an angle. The collar is bolted to a ring forming the back of the drum. The position of the carbons is shown to be horizontal. Lest the ascending hot-air current should lead to an oblique burning of the carbons and an unsteady light, an arc of soft iron, 4, almost encircling the positive carbon, has been placed near the arc. The current flowing through the carbon converts this iron into an electromagnet, which attracts the arc, so that the crater forms in the longitudinal axis and not obliquely. The lamp is made to slide in its longitudinal axis backward and forward by means of the hand wheel, 5, and when the arc is in the focus of the mirror an almost

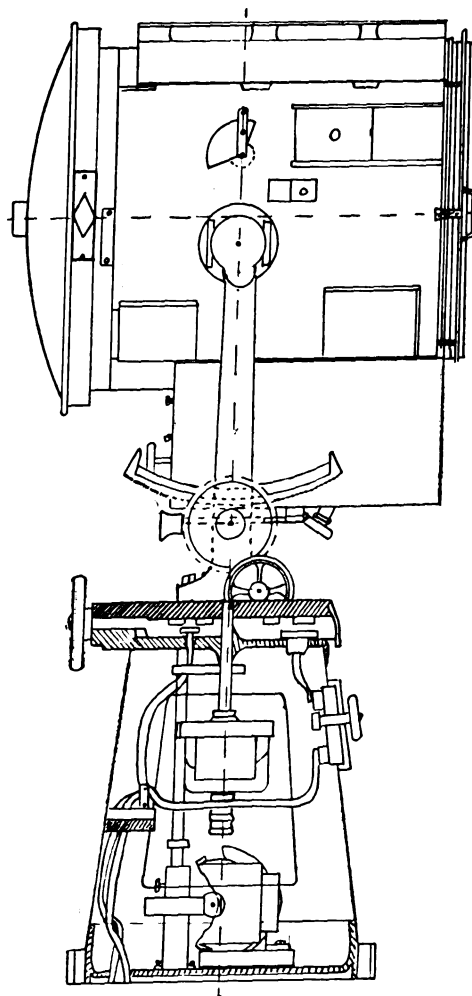


FIG. 4.
Electrically Operated Siemens Searchlight by Motor Control.

the crater touches the wire the arc is in focus. In front the case is either closed by an ordinary pane or by a dispersion lens. When the

latter is used the arc must always be in focus. The dispersion lens spreads the beam in the horizontal plane—the lamp itself and therefore the beam may be inclined of course—in order to illuminate the whole length of a torpedo-boat or other object close to the ship.

The searchlights are used a great deal at the present time for signaling at long distances, and are particularly well adapted to this class of work, although it can only be accomplished at night, while the latest scheme of the Marconi wireless telegraphy is operative at night or day and at much greater distances. One method of searchlight signaling is to use a round disk suspended on a spindle extending through the projector barrel between the

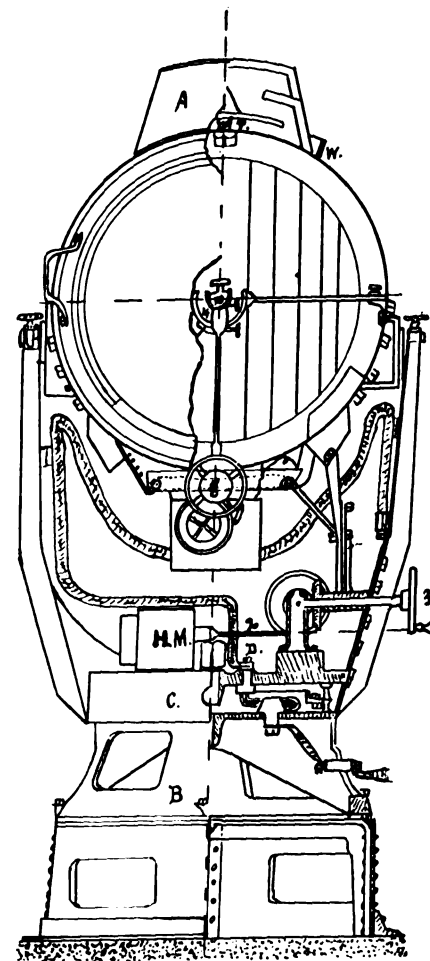


FIG. 5.
Schuckert & Co. Searchlight in Austrian Navy, Operated by Electric Motors.

lamp and the mirror and vibrating this by means of a small lever handle on the spindle. In other projectors flashing screens are used in front of the searchlight, vertical strips being used and working similar to a venetian blind, the movement of a lever opening or closing all of the slats and thus making the various signals.

Land Cables for Alaska.

THE Signal Corps is making arrangements to send to Alaska about 100 miles of land cable, which can be used in the water or on the land where it is impossible to make use of regular land wires. It has been found that cables are necessary over the tundra. In the winter time poles can be set in the tundra, but as soon as summer comes they fall down. The tundra is considered impassable, and wherever telegraph lines cross it cables will be used.

"Electricity's" Educational Series.

BY R. MAX EATON.

ARTICLE NO. 30.

(Concluded.)

Points for Review.

The following covers some of the points of the series, and it is suggested for the student, as a rehearsal, to write short essays on the points mentioned and to work out the problems given. The student should refer to the article covering any point for reference or aid, and in this way a general review of the series will be obtained which will refreshen the memory:

- 1—Into what four classes are the means for producing electrical action divided?
- 2—Which class applies to the means most generally used?
- 3—What is meant by the two terms electromagnet and permanent magnet? Refer to Article 1.
- 4—What are the laws governing induction?
- 5—Write a short essay on lines of force. Refer to Article 2.
- 6—What is known as Ohm's Law?
- 7—Find the voltage required to force four amperes of current over a resistance of 25 ohms.
- 8—How much current will flow over a circuit of 100 ohms if forced by 5 volts. Refer to Article 3.
- 9—What causes polarization in primary batteries?
- 10—Explain some of the methods used for depolarization. Refer to Article 4.
- 11—Write a series of instructions on the care of storage batteries.
- 12—What advantage is derived by placing glass covers over storage cells? Refer to Article 5.
- 13—Explain the principle of an ammeter. Refer to Article 7.
- 14—An induced current is always alternating. Why?
- 15—Explain the principle of a spark coil. Upon what law depends its action? Refer to Article 8.
- 16—What is one ampere turn? How do you find the ampere turns in a coil? Refer to Article 9.
- 17—To what effect in dynamos does the term hysteresis apply?
- 18—Induced currents are always alternating. Then the currents induced in the coils of an armature must be alternating. This being the case how do we get direct current over a circuit connected to the brushes? Refer to Article 10.
- 19—Why does reversing the current on the brushes of a motor reverse the direction of rotation?
- 20—Write an essay on the care of motors. Refer to Article 11.
- 21—Explain the three-wire system. What advantages are derived from it over two-wire systems? Refer to Article 13.
- 22—Write an essay on self-induction and its effects on alternating currents. Refer to Article 14.
- 23—Practically no alternating current flows

through the primary of a transformer when the secondary is not closed. Why? Why is the amount of flow in the primary governed by the amount of current being used from the secondary? Refer to Article 15.

24—Write an essay on the care of dynamos. Refer to Article 18.

25—Explain the principle of the telephone. Refer to Article 20.

26—What are the advantages of common battery systems over general or local systems?

27—Draw the Bell common battery circuit. Refer to Article 23.

28—Draw a test circuit where a voltmeter is used for testing. Refer to Article 24.

29—What causes electrolysis? Refer to Article 27.

30—What advantage is secured by placing a condenser across the contact of a vibrator? Refer to Article 29.

The Fate of Count Von Zeppelin's Balloon.

In the art of aerial navigation two distinct principles are recognized. One is based upon the idea entertained by Montgolfier. It consists in constructing a balloon that will rise and remain suspended in the air by the aid of the ascensional force developed by a gas imprisoned in the folds of its envelope. The other and more modern principle adopted by the aeronaut is that which seeks for its practical realization in the application of a dynamical motive force to a flying machine. The partisans of this system completely reject all use of gaseous bodies, whether in the form of hot air, common coal gas or pure hydrogen. They, on the contrary, rely altogether upon the scientific investigations which have been carried out respecting the physiological mechanism of the flight of birds, and upon the laws governing somewhat complicated mechanical movements. Professor Marey greatly contributed to elucidate the whole question by the ingenious methods of analysis he adopted in treating of the movements of flight. The new and more accurate calculations of Lillienthal and Loessl demonstrated the gross inaccuracy of the formula established by older mathematicians, and thus paved the way for the more modern inventors and designers of flying machines. Hiram Maxim, in the year 1894, and subsequently Langley, Hargrave, and recently Kretz, have all experimented with aeroplanes and flying machines.

The most serious and practical attempt made with a balloon, capable, or at least supposed capable, of being steered or directed, was that undertaken by Count von Zeppelin last year. Unfortunately, the experiments were inconclusive. The latest advices from Switzerland give an account of the disastrous condition to which this now famous balloon has been reduced. It appears that the violent storms which in January last swept over the central regions of Europe nearly demolished its resting place. The tempestuous gales blew in the windows of the timber shelter, furiously attacked the outer envelope of the aerostat, and ripped it open for about a third of its total length. The inner envelope, constructed of aluminum, fared no better. It was twisted out of all shape, and a large part of it literally torn away. Many of the cross pieces and uprights, also of aluminum, were bent, distorted, and in some cases actually broken. It is satisfactory to be informed that, in spite of these discouraging circumstances, the enterprising aeronaut intends to recommence his ascen-

sions in the coming summer. He has ordered two Daimler motors of a more powerful and lighter type than formerly, and it is to be hoped that some out of the dozen experiments contemplated may be attended with a decisive result of some kind.—"Engineer," London.

PROGRESS OF ELECTRICITY IN INDIA.

With the opening year of the twentieth century the Indian Section of the Institution of Electrical Engineers has been inaugurated, and, appropriately enough, at the first meeting of the section in Calcutta, Mr. F. G. Maclean, Director-General of Telegraphs, gave an interesting review of the progress of electricity in India during the past 50 years. At the beginning he called attention to the fact that until the last few years electrical work in India had been practically confined to the telegraph, which had also been the pioneer of electrical engineering in other countries. Just 50 years ago it was that Dr. (afterwards Sir) Wm. O'Shaughnessy first carried to a practical conclusion his idea of an electrical telegraph in India, but to those acquainted with the conditions of the country it would be no matter of surprise that the record of progress, excepting as related to telegraphs, could scarcely be favorably compared with that of many other countries. It was in 1851 that the first practical telegraph line was built from Calcutta to Diamond Harbor, and in the following year it was extended to Kedgeri, making in all a total length of 82 miles. This line was made of iron rod $\frac{1}{2}$ inch diameter, and on the overhead sections it was supported on bamboos, 200 to the mile. The great feature about this line was its remarkable strength, the bamboos bending to the storm, and thus preserving the line intact. Dr. O'Shaughnessy always adopted the plan of taking the line underground before entering an office in order to protect it from lightning effects.

The problem of crossing rivers was one of the first that pressed for solution in India, and in May, 1851, Dr. O'Shaughnessy succeeded in signaling across a river over 5,000 feet in breadth without any conductor. This system, however, could not be maintained, although it remained a remarkable achievement in wireless telegraphy. Nothing practical was done till gutta-percha-covered wire was imported from England, and then, after many trials, the system adopted was to secure this insulated wire in the angles of a strong chain cable. The success of the first pioneer line along the River Hughli decided the authorities in 1853 to commence the construction of a network of telegraph lines all over India, and at the present time the Department possesses 52,909 miles of line and 170,766 miles of wires, in addition to 283 miles of cable. Since 1853 the course of improvement had been the substitution of iron for wooden supports, the improvement in pattern of insulators, the gradual reduction in the weight of the wire used, and, finally, the use of copper instead of iron wires on main lines.

In 1857 Morse instruments superseded the small horizontal galvanoscopes previously in use; in 1858 there were 10,000 miles of line in operation or under construction, in the same year the first cable between India and Ceylon, a distance of 25 miles, was laid; through communication with Burmah was first established in 1865; the next year saw through communi-

cation with England by the Turkish route, while the route via Persia was opened in January, 1870, and via Suez and Aden in March the same year; duplex telegraphy was introduced in 1874, and in 1885 the quadruplex system was first used in India.

Referring to the Marconi system of wireless telegraphy, the author expressed wonder at the Department not taking advantage of it, especially having regard to the practical success of the system in connection with marine communication. Turning to other applications of electricity, the first record of an electric light installation in India was to light a goods shed in the Howrah Station yard in 1879. Various isolated installations sprang up from time to time in different parts of the country, but the first application of modern electrical engineering on any large scale was the electric tramway in Madras, in 1894, on the underground conduit system. A change was afterwards made to the overhead trolley system on account of the tropical rains, which at times flooded the conduit. The next application of importance was the Darjeeling electric lighting installation, which was the pioneer of high-tension transmission in that country, and in the last year of the century the Calcutta Electric Supply Corporation commenced operations. The latest development would be a system of electric tramways in Calcutta. In conclusion, the author thought there were unmistakable signs that India was now thoroughly awake to the great advantages of electrical power, and that efforts would be made to employ the enormous natural forces which lay at their disposal, such as water power. The most important scheme which was at present proposed was for the transmission of power from the Cauvery Falls to the Kolar gold-fields, a record distance of 100 miles.—From the "Electrical Engineer," London.

PARIS LETTER.

Special Correspondence of *ELECTRICITY*.

New Electric Arc Phenomenon.

At a meeting of the Paris Academy of Sciences, held April 22, M. Marey presented to the Society a communication from M. Koenig, entitled "Periodical Oscillations Produced by the Superposition of an Alternating Current Upon a Continuous Current in an Electric Arc." M. Koenig recalled to mind from the first that an electric arc between carbons produced by a continuous current could be considered as a telephone. As soon as arc lamp wires are exposed to the phenomenon of induction from neighboring conductors the arc undergoes modifications of such a nature as to produce a sound which is more or less accentuated; by further perfection of the apparatus, one can reach a point where the clear reproduction of speech may be made. During repetitions of his experiments the author has made researches on the influence of the superposition of sinusoidal currents upon continuous currents and the effects of such a superposition upon the light produced by the arc. For this purpose a closed circuit transformer (of 3 kilowatts) was placed in a 240 volt distributing circuit of 40 alternations—the primary winding at 308 turns and the secondary 85, divided into 5 sections at 17 turns each. By such a construction he was able to obtain tensions of 13, 26, 39, 52 and 65 volts. By placing in a continuous current circuit of 120 volts a metallic resistance, an arc lamp provided with a hand regulator

and one of the sections of the 17 turn secondary winding of the transformer, M. Koenig observed that immediately after the superposition of an alternating current that the light, which up to that time had remained stable, showed oscillations of a periodical luminous nature which followed each other slowly enough to be perceived by the eye, and that when the arc was lengthened he heard a feeble sound which corresponded to the 40 oscillations per second; the period of the light oscillations was about one twentieth of a second (estimated by the stroboscopic method). By increasing the intensity of this periodical current the luminous oscillations became stronger without change of frequency.

Extraction of a Nail from the Bronchial Tube by Means of an Electromagnet.

The above difficult and extraordinary operation has just been performed by Dr. Garel, of Lyons, France. A two year old child living at Buenos Ayres, South America, while at play had swallowed a very large nail, six centimeters long. After a short time the child came nearly suffocating, but finally by the next day all respiratory trouble had disappeared and it was supposed that the nail had passed through the digestive track, but while on a visit to France the child commenced to cough desperately and it was thought to be afflicted with chronic bronchitis, and trouble in breathing was found to come from the right side. After having heard the history of the child, Dr. Garvel thought the nail might be in the bronchial tubes. He made a radiographic examination of the child and it was found that the nail had lodged in the right bronchial tube. There was no hesitation in selecting a method to extract it. Tracheotomy was resorted to under an anesthetic and then an electromagnet was inserted through the opening and pushed down into the trachea as far as possible. The nail was immediately drawn from the bottom of the bronchial tube and became attached to the magnet. The electromagnet used was capable of supporting a weight of six kilograms and it was energized from two accumulators of four volts. Several days afterward a Bordeaux physician learned of this curious operation and performed a similar one on a three year old child, who was supposed to have swallowed a nail. By following the same methods he succeeded in drawing out the nail, which had become fixed in the left bronchial tube for a year.

MAGNALIUM.

On several occasions we have remarked the difficulty of obtaining any precise information about the properties of this comparatively new alloy of aluminum, says the London "Engineer." An article on the subject, however, has recently been printed in one of the German technical papers, from which we are able to extract the following particulars: Under the generic name of "magnalium," alloys are now prepared containing between 10 and 25 parts of magnesium per 100 of aluminum. With 10 parts of magnesium the material is said to have the mechanical properties of rolled zinc; with 15 parts to resemble cast brass; and with 20 or 25 parts of magnesium to imitate hard drawn brass and the various grades of red bronze. Dr. Mach, the inventor, finds that sodium, carbon and nitrogen in the original aluminum cause the alloys to be of no value; and this probably explains why the earlier attempts made by Wöhler to produce a useful

alloy of these two metals were quite unsuccessful. Additions of tungsten, nickel and copper, are not harmful to magnalium, except in so far as they increase the specific gravity of the alloy. Ten to 15 per cent. of antimony has the advantage of raising the melting point from 700° Cent. to a white heat. When less than 10 per cent. of magnesium is mixed with the aluminum, the alloy rolls well and is specially suitable for manufacturing sheet and tube. Large quantities of magnesium adapt it better for casting purposes.

The mechanical properties of magnalium have been investigated by Herr Kaempfer. The alloy turns well, yielding long coherent shavings; it can be drilled and milled readily, and does not slip or bind. Under the file it resembles soft brass; it does not clog, and the finest cut files can be used. It takes a high silver-white permanent polish; and it can be easily blackened. Its hardness is greater than that of pure aluminum, for it cannot be cut with a knife, so that cockplugs, spindles, gear-wheels and keys can be constructed of it. It shows a fine-grained fracture something like steel, instead of the coarse zinc-like appearance of aluminum. Its specific gravity is 2.52×0.03 . The tensile strength of magnalium ranges between 20 and 24 kilos. per square mm.—12.7 to 15.2 tons per square inch—whereas that of aluminum is only 7 kilos. per square mm.—4.5 tons per square inch. This is Kaempfer's figure for ordinary aluminum; we should prefer to quote 7 tons for cast metal, and 10 to 14 for sheet or bars. Magnalium can be easily coated with gold or nickel—electrolytically—and it can be soldered satisfactorily. The alloy is stated to resist the atmosphere well, not to "rust," and bear exposure to ammonia and sulphurous acid. It has been taken up by Voigtländer und Sohn, the opticians of Brunswick, while Siemens and Halske, of Berlin, are reported to be using it in armatures and motor car construction. At present its cost is high, as the price of magnesium is still 18 marks per kilo, but hopes are entertained that a larger market for magnalium may reduce the price of that metal considerably.

CANADIAN NOTES.

(From our Ottawa Correspondent.)

The Ottawa Electric Street Railway Company has asked the city council to pass a by-law providing for the punishment of spitting on the floors of the cars.

Mr. A. J. Macdonald, of Montreal, has just been appointed general superintendent of the street railway system of the city of Mexico. The Mexican company proposes to convert its dual system into an entirely electric road.

Montreal capitalists, who control the Gatineau and Pontiac railways and the new Inter-provincial bridge connecting the cities of Ottawa and Hull, are negotiating for the purchase of the Hull & Aylmer Electric Railway, which will enter Ottawa over the new bridge when the Montreal people get control. It is said that the price asked for the electric road is \$1,000,000.

Proposals Invited.

The Treasury Department is inviting sealed proposals until June 18, for installing an electric light and power plant in the United States Custom House at New Orleans, La., including engines, generators and switchboard. At the same time and place bids will also be

received for installing an electric light wiring system in the same building. Specifications and plans can be obtained upon application to the Department at Washington or of the custodian of the building.

Sealed proposals are being invited until June 20, for installing an additional 50 kw. engine and dynamo in the United States Court House and Post-Office Building at Kansas City, Mo. Plans and specifications can be obtained upon application to the Secretary of the Treasury, Washington, D. C., or of the custodian of the building.

Annual Meeting and Dinner of the New York Electrical Society.

The twentieth annual meeting of the New York Electrical Society for the election of officers will be held at the Café Boulevard, Second avenue and 10th street, Thursday, June 6, at 9 P.M., to be preceded at 6:45 P.M. by an informal banquet—tickets one dollar, without wine. The meeting and dinner will be followed by an entertainment in the place of speeches. Secretary Guy says that an excellent menu has been specially provided, and it is hoped that every member will make an effort to attend, to participate in this pleasant close to a very successful season.

With the object of studying the convenience of many of the members who are unusually busy at this season of the year, the Executive Committee requests that members go straight from their offices to the Café Boulevard and that no evening dress be worn.

Phonetic Poem on the New York Central.

N. Y. C. & H. R. R.,
No. 1 1-der's what U R.
From Gr8 N. Y. 2 Buffalo
U point the way that all should go
2 C the Fair that takes the bun
B-4 the close of 19-1.

Up the Hudson, 'cross the St8,
ThrU towns & cities small & gr8,
Past mountains high & valleys deep,
Where brave men f0 & heroes sleep,
Each foot of way a Nature shO
From Gr8 New York 2 Buffalo.

In day coach or parlor car,
Nothing's like U near or far;
U'R slowest train a cannon ball,
You speed ahead of rivals all.
A da-Z—that is what U R,
Gr-8 N. Y. C. & H. R. R.

—F. A. D.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended May 29:

Antwerp, 41 cases, \$2,412; Argentine Republic, 220 packages, \$5,732; Australia, 15 packages, \$8,750; Azores, 16 packages, \$145; Batoum, 2 cases, \$1,300; Berlin, 12 packages, \$220; Berne, 4 packages, \$2,800; Bilbao, 314 packages, \$39,913; Brazil, 178 cases, \$3,836; 36 packages, \$2,521; British East Indies, 32 packages, \$3,625; British Possessions in Africa, 269 packages, \$40,900; British West Indies, 7 packages, \$49; Charikar, 1 case, \$300; Chili, 6 cases, \$176; Cuba, 104 cases, \$2,978; Genoa, 45 packages, \$2,183; Glasgow, 2 packages, \$107; 2 reels cable, \$95; 54 cases, \$440; Hamburg, 66 packages, \$2,133; Havre, 27 packages, \$2,737; Hayti, 3 packages, \$106; Hull, 5 cases, \$716; Ipswich, 1 case, \$121; Liverpool, 163 packages, \$32,629; London, 712 packages, \$103,037; Manchester, 10 packages, \$1,632; Mexico, 371 packages, \$2,200; Milan, 79 cases, \$4,235; Naples, 57 cases, \$854; Oporto, 1 package, \$169; Peru, 32 packages, \$1,449; Rotterdam, 16 packages, \$162; Santo Domingo, 30 packages, \$635; Santander, 23 packages, \$340; Southampton, 3 cases, \$597; St. Petersburg, 24 cases, \$450; U. S. Colombia, 18 cases, \$293; Venezuela, 35 cases, \$1,075; Vienna, 1 package, \$50; 2 cases, \$1,982.

PERSONAL MENTION.

Mr. Charles T. Yerkes, the street railway magnate, is talking of buying a country residence in England, where he may reside permanently.

Mr. Charles W. Reynolds of Spokane, Wash., has been appointed district manager of the Pacific States Telephone & Telegraph Company, with headquarters at Spokane, to succeed G. B. Bush.

INCORPORATIONS.

The East Jordan Electric Light & Power Company, East Jordan, Mich. Capital stock, \$10,000.

The Atlantic Light & Water Company, Norfolk, Va.—to construct electric and gas lighting plants. Capital stock, \$500,000. T. R. Heller is president.

The Federal Development Company, Newark, N. J.—to develop all sorts of enterprises, including telephones, telegraphs and water rights. Capital stock, \$200,000.

The Gas & Electric Company of Corning, Albany, N. Y. Capital stock, \$375,000. Directors: Ashley T. Cole, New York City; L. B. Grant and H. L. Merry, Brooklyn.

The Weston Electric Power Company, Denver, Col.—to operate in Lake County. Capital stock, \$50,000. Incorporators: W. P. Garrison, E. R. Reed and J. W. Sanborn.

The Conestogo Electric Light & Power Company of Carroll County, Westminster, Md. Capital stock, \$100,000. Incorporators: E. C. Folger, D. S. Collett, H. Jarvis and others.

The Illinois X-Ray and Electro-Therapeutic Laboratory, Chicago, Ill.—to develop and give instruction in the uses of electricity. Capital stock, \$25,000. Incorporators: J. E. Gilman and others.

The Syracuse Lighting Company, Syracuse, N. Y.—to manufacture gas and electricity. Capital stock, \$2,500,000. Directors: Charles V. Nellany, Brooklyn; Harry F. Cues, Staten Island, and Richard F. McKiniry, New York City.

The Upper Hudson Electric Company, Albany, N. Y.—to furnish gas and electricity in towns and villages in Greene County. Capital stock, \$100,000. Directors: William O. Turner, New York City; Eugene Wolfe, Athens, and N. W. Dalton, Bath.

The Northwestern Wireless Telephone & Telegraph Company, Chicago, Ill.—to operate in Illinois, Wisconsin, Iowa, Minnesota, in the northern part of Michigan and in Arizona. Capital stock, \$5,000,000. Joseph S. Schwab is chief stockholder.

The Butte Electric Light & Power Company, Trenton, N. J.—to do everything connected with the manufacture and supply of electricity. Capital stock, \$2,500,000. Incorporators: William J. Denning, William H. Mansfield, Charles E. Estabrook, C. R. Dean, Thomas K. Henderson, C. L. Reed, I. F. Keeler, J. S. Anthony and William F. Bayton, all of Jersey City.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED MAY 28, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

675,027. Controller for Electric Cars. Walter W. Tice, Rahway, N. J., assignor of one-half to George H. Tice, Perth Amboy, N. J. Filed Aug. 1, 1900.

675,038. Electric Railway. Philip Farnsworth, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed May 31, 1901.

675,050. Electric Railway. Samuel B. Stewart, Jr., Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Feb. 21, 1901.

675,086. Electric Railway-Signal. William H. Council, Williamsville, Ill., assignor to the Miller Signal Company, Chicago, Ill. Filed April 19, 1900.

675,142. Trolley-Wheel. Herbert W. Smith, Medford, Mass., assignor of one-half to Arthur W. Field, Boston, Mass. Filed March 6, 1901.

ELECTRIC LIGHTS AND APPLIANCES.

675,033. Electric-Arc Lamp. Curt A. M. Borner, Berlin, Germany. Filed July 24, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

674,890. Static Machine. Henry E. Waite and Harry F. Waite, New York City. Filed April 10, 1901.

674,981. Controlling Electric Motors. Eugene C. Parham, Brooklyn, N. Y., assignor to the Lorain Steel Company of Pennsylvania. Filed Sept. 23, 1899.

675,049. Circuit-Breaker. Samuel B. Stewart, Jr., Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Jan. 21, 1901.

675,114. Electric-Motor Control. Bennet C. Shipman, Wilkesburg, Pa. Filed June 25, 1900.

675,177. Electric Switch. George B. Thomas, Hartford, Conn., assignor to the Perkins Electric Switch Manufacturing Company, same place. Filed Feb. 15, 1901.

675,293. Controller for Electric Motors. Oscar H. Pieper and Alphonse F. Pieper, Rochester, N. Y. Filed Aug. 27, 1898.

675,294. Electrical Controlling Apparatus. Oscar H. Pieper and Alphonse F. Pieper, Rochester, N. Y. Filed Feb. 2, 1900.

675,351. Safety Speed-Limiting Means. Garrett W. Hendricks, Indianapolis, Ind., assignor to the Hendricks Novelty Company, same place. Filed March 14, 1901.

TELEPHONES AND TELEPHONE APPARATUS.

674,860-674,861 674,954. Telephone-Circuit System. Ellis F. Frost, Washington, D. C. Filed June 27, 1900.

674,882. Telephone-Switchboard. Ellis F. Frost, Washington, D. C. Filed June 27, 1900.

MISCELLANEOUS.

674,858. Contact for Controllers or Reversing-Switches. John Trier, Chicago, Ill., assignor, by mesne assignments, to Donald Grant, Faribault, Minn. Filed April 26, 1900.

674,859. Automobile. John Trier, Chicago, Ill., assignor, by mesne assignments, to Donald Grant, Faribault, Minn. Filed April 26, 1900.

674,867. Circuit Operating Device. Percy C. Howe, Boston, Mass. Filed March 12, 1900.

674,927 674,934. Electrode for Electrolytic Cells. Max Mauran, Niagara Falls, N. Y., assignor, by mesne assignments, to the Castner Electrolytic Alkali Company of Virginia. Filed March 16, 1900, March 26, 1900. Renewed April 27, 1901.

674,930 674,931-674,932 674,933. Electrolytic Cell. Max Mauran, Niagara Falls, N. Y., assignor, by mesne assignments, to the Castner Electrolytic Alkali Company of Virginia. Original applications filed March 16-26, 1900. Divided and these applications filed June 14, 1900, Oct. 10-16, 1900.

674,942. Automatic Current-Regulator. Severn D. Sprong, Long Branch, N. J., assignor of one-half to James H. Harnden, Brooklyn, N. Y. Filed March 16, 1901.

674,947. Automatic Regulating-Switch. Frederick J. Tolchard, Paignton, Eng. Filed Oct. 29, 1900.

675,001. Apparatus for Connecting Electric Meters in Three-Wire Circuits. John R. Dick, Brighton, Eng., assignor to the Mutual Electric Trust, Limited, same place. Filed March 9, 1900.

675,028. Brake Mechanism for Automobiles. John Trier, Chicago, Ill., assignor, by mesne assignments, to Donald Grant, Faribault, Minn. Filed April 26, 1900.

675,056. Magnetic Separator. Thomas A. Edison, Llewellyn Park, N. J. Filed June 12, 1897.

675,065. Device for Operating and Controlling Electric Automobiles. Frank F. Loomis, Akron, O., assignor to the International Fire Engine Company, New York City. Filed Nov. 6, 1900.

675,087. Transmitter-Arm. James F. Craven, Pittsburg, Pa. Filed Jan. 9, 1901.

675,133. Transmitting-Gear. Antoine Janssens, St. Nicolas, Belgium. Filed Aug. 21, 1900.

675,158. System of Electrical Distribution. Albert S. Hubbard, Belleville, N. J., assignor to Charles A. Gould, Port Chester, N. Y. Filed April 5, 1900.

675,162. Magnetic Separator. Benjamin Noble, Detroit, Mich., assignor of one-half to John G. Dietz, same place. Filed Aug. 27, 1900.

675,292. Voltaic Shoe. Elmer E. Phinney, Niantic, Conn. Filed Nov. 3, 1900.

675,303. Electric-Fixture Base. James W. Smith, Brooklyn, N. Y. Filed Oct. 15, 1898.

675,323. Lifting-Magnet. Eugene B. Clark, Chicago, Ill. Filed May 22, 1900.

675,331-675,332. Sound Recording and Reproducing Device. Eldridge R. Johnson, Philadelphia, Pa. Filed Jan. 20, 1900.

675,349. Graphophone. Frank L. Capps and Victor H. Emerson, Newark, N. J., assignors to the American Graphophone Company of West Virginia. Filed Feb. 18, 1901.

DESIGNS.

34,577. Motor-Vehicle Frame. Edward Beach Gallaher, Philadelphia, Pa. Filed April 13, 1901. Term of patent 7 years.

34,578. Underframe for Automobiles. Harry M. Wells, Bridgeport, Conn., assignor to the Locomobile Company of America, New York City. Filed Jan. 12, 1901. Term of patent 14 years.

THE TELEPHONE WORLD.

Annual Convention of the Independent Association.

The fifth annual convention of the Independent Telephone Association of the United States of America will be held in June, on the 11th, 12th and 13th, at Buffalo, N. Y. The headquarters of the Association will be at the Iroquois Hotel, and the convention will be held in the banquet room of the Convention Hall, Virginia street and Elmwood avenue. Following is the programme:

Tuesday, A.M.—Reception of delegates, distribution of badges, tickets, etc., at headquarters, Iroquois Hotel.

Tuesday, noon.—Opening of the convention in the banquet room of the City Convention Hall, Virginia and Elmwood avenue. Address of welcome. Response by President James M. Thomas. Annual address by the president.

Tuesday, P.M.—Inspection of exhibits made by manufacturers in connection with headquarters at the Iroquois Hotel.

Wednesday, 10 A.M.—Second session of the convention at Convention Hall. Paper by Hon. S. P. Sheerin, Indianapolis, Ind., subject, "Village Exchanges, Farmers' Lines, Rates and Other Lessons." Discussion by J. B. Ware of Detroit, Mich., and T. J. Fricker, Ashtabula, O. Paper by Charles E. Wilson, Philadelphia, Pa., subject, "Independent Telephone Development East of the Alleghenies." Discussion by C. E. Stinson of Rochester, N. Y., and Senator C. W. Line of Hazleton, Pa. Reports from various States and other business.

Wednesday afternoon.—Inspection of exhibits by manufacturers in connection with headquarters at the Iroquois Hotel, Pan-American Exposition and Niagara Falls.

Thursday, 10 A.M.—Third session of the convention at Convention Hall. Reading of paper by H. D. Critchfield of Cleveland, O., subject, "Legislation and Litigation." Discussion by Ed. Kibler of Newark, O., and C. S. Bush of Fort Wayne, Ind. Reading of paper by E. B. Fisher of Grand Rapids, Mich., subject, "Bell Methods." Discussion by George W. Beers of Fort Wayne, Ind., and W. A. Bisbee of Savannah, Ga. Election of officers and unfinished business.

The officers of the Association are: James M. Thomas, president, Cleveland, O.; H. C. Young, first vice president, Columbia, Pa.; C. E. Stinson, second vice president, Rochester, N. Y.; H. E. Teachout, third vice president, Des Moines, Ia.; S. P. Sheerin, secretary and treasurer, Indianapolis, Ind.; R. F. Johnson, first assistant secretary, Saginaw, Mich.; Sam E. Wayland, second assistant secretary, Wilkes-Barre, Pa.

The Atlantic Telephone Company, which controls the franchise granted by the former city of Brooklyn to the New York & Eastern Telephone Company, and which alleges that it had a capital of \$5,000,000 all paid in, has made application to Commissioner Kearny of the Department of Public Buildings, Lighting and Supplies for a permit to use the subways and to string wires. Commissioner Kearny sent the application to the Corporation Counsel and asked him whether he was obliged to grant it "in view of the fact that there have been so many similar schemes presented to me for approval, which I have reason to believe were organized as schemes to get money out of the public or out of existing corporations, rather than for the specified purpose of operating a telephone company." The Corporation Counsel advised Mr. Kearny that he must use his judgment about granting permits.

A deal has recently been completed in Bellefonte, Pa., whereby the Central Commercial Telephone Company of that place, operating lines in Center, Clinton, Union, Huntingdon and Clearfield Counties, has been purchased by and merged into the United Telephone & Telegraph Company of Pennsylvania, a company which now owns all the former independent companies between Philadelphia and Altoona. It is hoped lines through to Pittsburg may be acquired, giving a complete line with the Bell Company. The stockholders of the Central Commercial Company will be given their preference of stock or 5 per cent. bonds in the United Company, or their holdings will be purchased outright at par.

The Maryland Telephone & Telegraph Company has awarded the contract for supplying the poles for a telephone line to Reisterstown, and hence to Westminster, Md. The line will follow the turnpike and parallel the line of the Chesapeake & Potomac Company. It is to be constructed within the next 30 days. The Chesapeake & Potomac Company is preparing to put in an exchange at Reisterstown, Md.

By the completion in Wheeling, W. Va., of a new system by the National Telephone Company of Baltimore, Md., the company has placed the rate for residence telephones at \$24 a year, and the Bell, it is said, is preparing to cut to \$15 or \$18 for the same service, with a proportionate reduction on long-distance telephones.

The Manufacture of Telephone Apparatus in Cleveland.

Telephone men say that Cleveland is fast becoming the national center for the manufacture of telephone apparatus. There are already a number of important companies for the manufacture of telephone instruments in operation as well as a number of construction companies which make a business of installing lines and switchboards for new companies.

Cleveland has long been an important center for financing independent telephone companies, but the manufacturing and construction companies are making even greater headway in national importance. The location of the city, approximately midway between New York and Chicago, gives Cleveland certain advantages for the telephone business, and the development of telephone companies in the portion of the country of which Cleveland is the manufacturing center is more rapid than farther West where the cities and towns are not so close together and therefore the development of interurban lines not so rapid.

Great Demand for Telephones in Havana.

A. F. Blundell, manager of the telephone companies in Havana, has lately been in Chicago to obtain 2,500 automatic telephones for use in the island. He says:

"Telephones there are in greater use than in any American city of the same size. People like to use them and they have become a necessity. The warm climate and the habits of the people unite to cause the residents of Havana to make constant use of the telephone.

"All that stands in the way of an immediate boom in Cuba is the Foraker resolution, which forbids grants and franchises from the provisional Government. Capital in all lines of business is simply waiting."

The stockholders of the Dauphin County, Pa., Telephone Company lately held its annual meeting, and elected the following officers: B. F. Meyers, president; W. D. Barnard, vice-president; Charles D. Stucker, secretary; C. A. Lee, treasurer; Meade D. Detweiler, was elected solicitor for the company. The contract for the construction of the new plant costing not less than \$300,000 has been let and one of the largest and best telephone systems will soon be added to the many new improvements of the capital city.

The Ford & Hiller telephone line to Early Bird, Fla., was completed a short time ago. It has two strands of wire and is first-class in all respects, and puts Ocala in communication with the phosphate mines in that region, and will be worth a great many dollars to the latter place.

M. D. Shaw of Ohio, promoter of the Orange, Tex., Telephone Company has lately been in Orange on business connected with his company. He is putting in a long-distance system that will connect the several Texas towns and cities in which the company is now busy putting in exchanges.

A resolution adopted by the Chillicothe, Ill., city council, granting T. VanAntwerp the right to construct a telephone system, has been placed on record in the recorder's office. The provisions of the resolution are that a system can be constructed, the poles to be placed in alleys where possible, and that the franchise extends for 15 years.

At a recent meeting of the stockholders of the Brookings, S. D., telephone exchange, it was decided to expend about \$2,500 in rebuilding and enlarging the plant and erecting a fire-proof office building.

The recent activity of the People's Telephone Company, in Victor, N. Y., and vicinity, has evidently stirred the Empire State Telephone Company to action, and a representative of that company was in Victor recently soliciting subscribers for a local exchange.

The Diamond State Telephone Company has spent \$20,000 in Queen Anne's County perfecting telephone lines connecting Centerville and other towns of Maryland with the system.

The Home Telephone Company of Dayton, O., has been granted a franchise by Judge McCann after a fight for several years.

The Twin City Telephone Company has filed plans with the St. Paul, Minn., building inspector of its new exchange, which will cost about \$10,000.

A new telephone line is being built from Kirksville to Quincy, Mo.

Lumpkin, Ga., is putting in a telephone system.

Consolidation of Independent Telephone Lines.

There was recently effected in New Iberia the consolidation of nearly all the independent telephone systems of Southwest Louisiana, comprising the Baton Rouge property, that at Thibodaux and the Teche and Vermillion at New Iberia. The company is now ready for business and will construct new exchanges and toll lines. The company is chartered under the name of the Louisiana & Texas Long Distance Telephone Company, Limited, with the following as board of directors: Hon. R. F. Broussard, R. F. Hoggsett, P. E. Braud of Thibodaux; L. H. Lancaster of Thibodaux, Ben R. Mayer of Baton Rouge, H. D. Giles of New Iberia.

The first officers of the company are: R. F. Hoggsett, president and general manager; R. F. Broussard, vice president; H. D. Giles, secretary and treasurer; L. H. Lancaster, superintendent of construction.

The domicile is New Iberia. The company will remodel all its toll lines with up-to-date material, and it is intended in the near future to connect up with New Orleans.

Mr. E. F. Clarke, M. P., of Toronto, Ont., has written the city solicitor of Toronto, advising that a suit be entered against the Bell Telephone Company without delay in order to fortify the city against the legislation which the company will again apply for next year. He says that it is absolutely imperative that the public mind be aroused on the telephone question, and that the validity of the claim in the act of 1892, purporting to place the rates to be charged by the company under Government control, should be determined also.

The latest institution which is making strides to enter Crowley, La., is the Texas & Louisiana Long Distance Telephone Company, which was recently formed at New Iberia by a number of the Louisiana local exchanges forming a combine. This company has stated its willingness to put an exchange in Crowley, if a subscription guaranteeing them 150 phones can be secured. Lee Adam has interested himself in the matter and is circulating the paper.

The New England Telephone Company has completed the line at North Deer Isle, Me., and connection with the main line has been established. The cable across Eggemoggin Reach is 6,050 feet long, 1 3/4 inches in diameter and weighs 11 tons.

The Chicago Telephone Company has purchased property in South Chicago and will erect its South Chicago exchange on the site, which is in the heart of the business district. The building will cost about \$35,000.

The plant of the Stromberg-Carlson Telephone Manufacturing Company of Chicago is to be enlarged by two additional stories. The work will cost \$30,000.

Permission has been granted the Ossipee Valley Telephone Company to erect poles and string wires on the various highways in Lovell, Me., and it is expected that operations will begin immediately.

The new telephone line from Unitia to Coytee, Tenn., is completed.

TELEPHONE INCORPORATIONS.

The Lima Telephone & Telegraph Company, Lima, O. Capital stock, \$150,000.

The Mansfield & Carbon Co-operative Telephone Company, Indianapolis, Ind. Capital stock, \$2,500.

The Hancock Telephone Company, Hancock, N. Y. Capital stock, \$3,000. Directors: E. J. Cotler, C. L. Wheeler and S. N. Wheeler, all of Hancock.

The Mount Ayr Mutual Telephone Company, Mount Ayr, Ia. Capital stock, \$5,000. Officers: J. H. Ailyn, president; Carl Lunney, vice-president; G. A. Wyant, secretary, and Clyde Dunning, treasurer.

The Garnaville Telephone Company, Garnaville, Ia. Capital stock, \$10,000. Officers: Arthur A. Schmidt, president; Joseph Wriell, vice-president, and R. O. Schumacher, secretary and treasurer.

The Watervliet & Green Island Telephone Company, Albany, N. Y. Capital stock, \$25,000. Directors: Samuel D. Rawson, Frederick H. Sudrow, Thomas F. Brush, Frederick W. Martin, Irving W. Griswold and E. Lord, all of Elyria, O., and Howard Hendrickson of Albany.

The Citizens' Telephone Company, Elmira, N. Y.—to operate in Elmira and Chemung County. Capital stock, \$250,000. Directors: Charles H. Stewart, Joel H. Fuller, Kerm F. F. Gill, Charles B. Stowe, Byron L. Moore and Bert G. Hubbell, Cleveland; Alexander C. Eustace, Charles H. Knipp, Charles A. Pulford and Joseph P. Eustace, Elmira.

GENERAL ELECTRICAL NEWS.

Lighting.

Arkadelphia, Ark.—J. W. Urlson of this city has purchased the plant of the old water and light company and will soon install five dynamos.

Beach City, O.—The village council is considering the question of erecting an electric light plant.

Bevier, Mo.—The citizens are agitating the question of electric lights.

Columbus, O.—Director Immel of the department of public improvements is making arrangements to erect a new municipal electric light plant on the site of the present waterworks.

Decorah, Ia.—The Decorah Electric Light Company has increased its capital stock to \$50,000.

Frankfort, N. Y.—At a recent special election here it was voted to borrow \$18,000 to erect an electric light plant.

Girardville, Pa.—Philadelphia capitalists are preparing to erect an electric light plant in this city.

Glendive, Mont.—The Hughes Electric Light Company has been granted a franchise here.

Grand Rapids, Wis.—At a recent meeting of the directors of the Electric & Water Company it was decided to increase the capacity of the electric light plant by putting in a new engine, boiler and dynamo, which will cost about 12,000.

Hubbard, O.—An election will be held June 8 to vote on the question of issuing \$8,000 in village bonds for the purpose of erecting an electric light plant to replace the one destroyed by fire recently.

Indianapolis, Ind.—The board of works and city engineer have completed the specifications for the new public electric lighting contract and they have been sent to the city attorney for legal retouching. Bids are to be advertised for soon.

Luther, Mich.—J. Bessey is prospecting with a view to putting in an electric light system here.

Manning, Ia.—An electric light plant will soon be erected here by a corporation which is now forming with \$10,000 capital stock.

McGrawville, N. Y.—This village is to be lighted with electricity.

McHenry, Ill.—This place is to have an electric lighting plant.

New London, Ia.—Civil Engineer F. Standard of Waterloo, has prepared estimates of an electric lighting plant, which it is proposed to erect here.

Omaha, Neb.—The Union Pacific contemplates installing its own electric light plant at the Union depot in this city.

Penn Yan, N. Y.—The trustees of Penn Yan have advertised for sealed proposals for lighting the village with from 50 to 70 electric arc lights for the term of one to five years from July 1, 1901. The parties bidding will be expected to furnish a certified check of \$1,000 with each bid. All bids are to be in the hands of the committee, Trustees William C. Tracy and Jasper O. Smith, by 12 o'clock noon, June 15, 1901, and same will be opened at 8 P.M.

Provincetown, Mass.—The Provincetown Electric Light Company has been incorporated with a capital of \$15,000. E. C. Holman is president and H. O. Goldsmith, treasurer.

Rome, N. Y.—The electric light and gas plant of this city is to be rebuilt. J. C. Sloan will superintend the work.

Sioux Falls, S. D.—Sioux Falls has decided to erect a municipal electric light plant.

Shakopee, Minn.—Aldermen Kauth, Ring and Spindler, the committee on electric lights, are investigating with a view to erecting a plant here.

Sharpsburg, Pa.—Bids will be received by the borough clerk until June 12 for installing electric light machinery and furnishing arc lamps, etc. F. A. Smith, E. Roesler and G. D. McMorran are on the water and light committee.

St. Joseph, Mich.—The board of public works has under consideration bids for the erection of an electric light plant.

Thorp, Wis.—The village board is making arrangements to erect an electric light plant.

Walhalla, S. C.—J. W. Shelor has been granted a

franchise for the construction of a system of waterworks, and an electric light plant here.

West Alexandria, O.—A movement has been started to organize a company, and a franchise will be asked for furnishing electric light and power.

West Stewartstown, N. H.—The William F. Allen Electric Company is preparing to extend its lines so as to furnish lights for the villages of Beecher Falls and Riverside.

Williamsport, Pa.—The Lycoming Electric Company, which has a monopoly of the electric lighting business here, will replace its two power houses with one central plant of over 3,000 horse power.

Street Railways.

Biloxi, Miss.—The new street railway in which J. Carraway is interested will erect an electric plant for power.

Boston, Mass.—A syndicate has been formed among Boston capitalists to build an electric railway in Washington, between Seattle and Tacoma, a distance of 33 miles. Lee, Higginson & Co., Kidder, Peabody & Co., and Stone & Webster are members of the syndicate.

Cumberland, Md.—A power house to cost \$80,000 will be built for the proposed electric road from this city to Lonaconing. Address J. MacCarroll, president of Penn State Construction Company, 735 Drexel Building, Philadelphia, Pa.

Dansville, N. Y.—An electric railroad is projected from here down the Genesee Valley to Rochester.

Dayton, O.—The Dayton & Germantown Traction Company has secured with one or two exceptions a private right of way for its electric line from the Dayton Soldiers' Home to Middletown.

Fresno, Cal.—Another electrical street railroad is to be built. S. N. Griffith is the promoter, and application will shortly be made to the city trustees for a franchise.

Gettysburg, Pa.—The city council has given the Baltimore, Westminster & Gettysburg Railway Company the use of streets for an electric railway.

Illipolis, Ill.—The village council has granted a franchise to Messrs. Myers & Dempsey, representatives of the new electric railroad between Springfield and Decatur, which give the company the right of way through this village.

Jackson, Mich.—The Detroit & Chicago Traction Company has purchased a site for a new power plant in this city. The buildings and equipments will cost \$250,000.

Louisville, Ky.—The question of building a suburban electric road from Charlestown to this city is being agitated.

Maryville, Mo.—This place is to have an electric line in the near future.

McConnellsburg, Pa.—A trolley line has been projected to run from Mercersburg to this place.

Rutland, Vt.—The property and franchise of the Rutland Trolley Street Railway in this city were lately sold to a syndicate of New York capitalists. An extension of the tracks into surrounding towns is contemplated.

Mobile, Ala.—The movement to build an electric railway along the gulf coast is again being agitated, and it is now announced that the contract has been let for part of the road.

New York City.—The scheme to establish a suburban electric railway between the postoffice and the towns of Southwestern Connecticut, as described last winter, has awakened those interested, and it is claimed may soon obtain the support of John B. McDonald, the chief contractor of the Rapid Transit Subway.

Oneida Castle, N. Y.—The Oneida Construction Company, incorporated at Albany with a capital of \$50,000, is to build an electric railway from here to Sylvan Beach, taking over also the franchises of the present road from Oneida to Oneida Castle. C. Loomis Allen of Lorain, O., is one of the directors.

Philadelphia, Pa.—The American Railway Company is endeavoring to secure a 50-year ordinance to permit it to build and operate an electric road in Chicago.

San Jose, Cal.—The purchase of the electric line from San Francisco to San Mateo by Eastern capitalists is considered the first step toward the building of a line between San Francisco and this city.

Santa Ana, Cal.—If the projects now under way are carried to completion, this city before very long will become an important center of electric railway lines. The Santa Ana & Orange Motor Company has obtained a franchise between here and Los Angeles, via Orange, Anaheim, Fullerton and Whittier, and another company, in which Major S. H. Finley of this city seems to be the moving spirit, is working on a right of way between Santa Ana and Long Beach.

Sheboygan, Wis.—The city council has granted J. M. Seamann a franchise for an electric railroad.

Uniontown, Pa.—The Monessen, Webster, Belle Vernon & Fayette City Street Railway Company has been organized by S. M. Graham, F. M. Fuller, C. H. Seaton and others of this place, with \$60,000 capital stock, to build an electric road along the Monongahela River for 10 miles from Webster to Fayette City.

Watertown, N. Y.—Papers incorporating the Watertown & Carthage Traction Company, capitalized at \$200,000, have been filed in the county clerk's office. The company will build a street surface railroad, to be operated by electricity, and to connect this city, Black River, Felt's Mills, Great Bend and Carthage. The length of the road will be 20 miles. Construction will be begun this summer. Arthur S. Fairchild, John W. Horner, Jr., New York City; Ernest S. Emanuel, Brooklyn; G. T. Hollister, Rutherford, N. J.; Clyde Notman, Short Hills, N. J.; John N. Carlisle, Francis M. Hugo, Leroy L. Luther and Mason M. Swan, Watertown, are the directors for the first year.

Williamsport, Pa.—The Williamsport & Lock Haven Traction Railway Company has received a charter to construct a line from Lock Haven to Jersey Shore. The company is capitalized at \$150,000. Hon. H. Cochran of this city is president.

Manufacturing.

New York City.—The Goudey-McLean Company of this city has been formed to manufacture electrical machinery with a capital of \$3,000. E. E. Goudey, Hackensack, N. J.; L. W. Miller, West Nyack, and Robert McLean, New York City, are the interested parties.—The Oak Motor Company will manufacture electric motors on a capital of \$2,000. J. P. Carl, G. B. Ackerly and Jerome Bradley of Brooklyn are the directors.

Youngstown, O.—The Anchor Electric Company, with a capital \$50,000, is being organized here to manufacture electric lamps and other appliances. N. L. Norris, R. P. Hamilton, Charles N. Crandall, Fred Keast, H. W. Davis and Thomas Carr are the promoters.

Company Matters.

Boulder, Col.—The Boulder Electric Light Company has been reorganized and the new company will be known as the Boulder Light & Power Company with \$100,000 capital stock.

Duluth, Minn.—Announcement is made of the consolidation of the Richardson Electric Company and the Zenith City Electric Company. The name of the new company is the Northern Electric Company.

Suffield, Conn.—The Suffield Electric Light Company at its annual meeting elected the following officers for the ensuing year: President, Warren W. Cooper; secretary and treasurer, Edmund Halladay; superintendent, Apollos Fuller.

Power and Transmission.

Globe, Ariz.—This town will be supplied with an electric power plant, which will be erected on Salt River, 30 miles above here.

Automobiles.

Newark, O.—The Newark Auto-Coach Company was recently formed with a capital of \$10,000.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by **ELECTRICITY** from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

NAME.	Par	Author'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Author'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y.—June 4							Hartford Conn.—June 3						
United Traction.....	100	\$5,000,000	\$5,000,000	1½ % Q.	106	108	Hartford Street Ry. Co.....	100	\$4,000,000	\$200,000	8 % R., Oct.	130	—
(Consolidation of the Albany and Troy City Railway.)							Hartford & West Hartford.....	100	1,000,000	247,000	—	—	—
Allentown Pa.—June 3							Holyoke Mass.—June 3						
Allentown & Lehigh Val. Trac Co		4,000,000	1,800,000	—	—	18	Holyoke Street Ry. Co.....	100	600,000	400,000	8 % A., June	207½	213
Bridgeport, Conn.—June 3:							Hoboken N. J.—June 3						
Bridgeport Traction Co.....	100	2,000,000	2,000,000	1 % Aug.	100	—	North Hudson Co. (N. J.) Ry. Co..	50	1,250,000	1,000,000	8 %	180	—
Baltimore Md.—June 3							Indianapolis, Ind.—June 3						
United Railways & Elec. Co.....com	50	24,000,000	12,000,000	—	16½	16½	Indianapolis Street Ry.....	—	5,000,000	5,000,000	—	25	25½
Boston, Mass.—June 3							Lancaster, Pa.—June 3						
New England Street Ry.....	25	5,000,000	1,081,925	1 % Q., Jan. 15.	—	—	Pennsylvania Traction Co.....	100	10,000,000	9,800,000	—	—	—
North Shore Traction Co.....com.	100	4,000,000	4,000,000	—	15	16	Lancaster & Col. Electric Ry.....	—	—	87,500	—	—	—
North Shore Traction Co.....pfd.	100	2,000,000	2,000,000	6 % S. A. & O.	85	87	West End Street Railway.....	—	—	—	—	—	—
West End Street Ry. Co.....com.	50	10,000,000	4,000,000	8 % S. A. & O.	95	95½	Louisville, Ky.—June 3:						
West End Street Ry. Co.....pfd.	50	4,000,000	6,400,000	4 % S., Jan.	114	115	Louisville Ry.....com	100	4,000,000	8,500,000	1½ % S., April.	82	88
Boston Elevated R. R.....	100	10,000,000	—	2½ % Aug. 99.	179	181	Louisville Ry.....pfd	100	2,500,000	2,500,000	2½ % S., Oct. 1.	112	118
Brooklyn N. Y.—June 3:							Minneapolis, Minn.—June 3						
Brooklyn City Ry.....	100	2,000,000	1,928,400	—	242	244	Twin City Rapid Transit.....com	100	17,000,000	15,010,000	—	68½	68½
Brooklyn Rap. Transit Co., tr. cert.	100	48,000,000	48,000,000	—	82½	84½	Twin City Rapid Transit.....pfd	—	8,000,000	1,712,200	1½ % S., Oct.	86	127
Brooklyn Heights Railroad.....	—	200,000	200,000	—	107	109	Montreal, Canada.—June 3						
Brooklyn City RR.....guar.	100	12,000,000	12,000,000	8½ % Q., Jan.	257	259	Montreal Street Ry. Co.....	50	4,000,000	4,000,000	8 % S., M. & N.	279	280
Brooklyn Queens Co. & Sub. RR.	100	2,000,000	2,000,000	—	—	—	Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1½ % S., J. & J.	10½	110½
Coney Island & Brooklyn RR.....	100	2,000,000	1,864,200	2½ % Nov.	825	830	Memphis Tenn.—June 3						
Kings County Elevated.....	100	4,750,000	4,750,000	—	—	—	Memphis Street Railway Co.....	100	800,000	800,000	—	25	—
Kings County Traction Co.....	100	4,500,000	4,500,000	1 % July	82	83	New Haven, Conn.—June 3:						
Nassau Electric Railroad.....pfd.	50	2,000,000	2,000,000	—	—	—	Fair Haven & Westville RR.....	25	2,000,000	2,000,000	8 % S., Sept.	59	61
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000	—	—	—	New Haven Street Railway Co.....	100	1,250,000	1,000,000	2½ % A., July	—	—
Brooklyn, B. & W. R. Railroad...	—	1,000,000	1,000,000	—	—	—	New Haven & Centerville.....	100	700,000	800,000	—	—	—
Buffalo N. Y.—June 3							Winchester Avenue RR.....	25	1,000,000	600,000	—	—	—
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	—	74	75	New Orleans, La.—June 3						
Buffalo Railway Co.....	100	6,000,000	5,870,500	1 % Q. Dec.	99	100	Canal & Claiborne RR. Co.....	40	240,000	240,000	4 % S., July	—	—
Columbus O.—June 3							New Orleans & Carrollton RR.....	100	1,300,000	1,200,000	1½ % Q., Oct.	148½	150
Columbus Street Railroad.....	100	8,000,000	8,000,000	1 % Q., Feb.	88	88½	New Orleans Traction Co new com.	100	—	—	—	—	—
Columbus Street Railroad, pfd.....	100	1,500,000	1,500,000	—	92	93	New Orleans Traction Co new pfd.	100	—	—	—	—	—
Charleston, S. C.—June 3							Crescent City RR.....guar.	100	2,000,000	2,000,000	8 % S., Jan.	20½	26
Charleston City Ry. Co.....	50	100,000	100,000	8 % S.	—	—	New Or. City & Lake RR.....guar.	100	2,000,000	2,000,000	4 % S., Jan.	—	—
Enterprise City RR. Co.....	25	1,000,000	250,000	—	—	—	Orleans Railroad.....	50	500,000	185,000	1½ % S., June	—	—
Chicago, Ill.—June 3							St. Charles Street Railway.....	50	1,000,000	1,000,000	1½ % S., Oct.	56½	57
Chicago City Ry. Co.....	100	12,000,000	12,000,000	8 % Q., Dec. 31.	250	260	New York—June 3:						
Chicago & South Side R. T. RR.....	100	10,828,800	10,828,800	—	—	—	Central Crotona RR.....	100	600,000	600,000	2½ % Q.	175	200
Lake Street Elevated RR.....	100	10,000,000	10,000,000	—	18½	14	Christopher & 10th Sts. RR.....guar.	100	650,000	650,000	2 % Q., Oct.	255	265
Metropolitan West Side Elev. Ry....	100	15,000,000	7,000,000	Feb. 28 1900.	84½	84	Dry Dock, E. Brd'wy & Battery RR.	100	1,200,000	1,200,000	1½ % Q., Nov.	120	125
Met. West Side El., pfd.....	100	15,000,000	9,000,000	—	88	88½	Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000	2½ % Q., Feb. 1901.	173½	174
North Chicago Street RR.....	100	10,000,000	6,000,000	8 % Q., Jan.	209	210	Bleecker St. & Fulton St. Ry. guar.	100	900,000	900,000	2½ % A., July	26	27
North Chicago City RR.....	100	10,000,000	6,000,000	—	197	200	Broadway & Seventh Ave.....guar.	100	2,100,000	2,100,000	2½ % Q.	286	290
South Chicago City Railway.....	100	2,000,000	1,000,000	—	108	109	Gen. Park N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2½ % Q.	206	210
West Chicago St. RR. Co.....	100	20,000,000	12,189,000	1½ % Q., Feb.	104	104½	AEighth Avenue RR.....	100	1,000,000	1,000,000	—	298	305
Union Traction Ry.....com	100	1,250,000	624,900	85 %	19	19½	42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	4½ % Q.	392	405
Union Traction Co.....pfd.	100	2,000,000	2,000,000	6 % S.	59	59½	Ninth Avenue RR.....guar.	100	800,000	800,000	—	198	202
Cincinnati, Ohio.—June 3:							Sixth Avenue RR.....guar.	100	2,000,000	2,000,000	—	204	205
Cincinnati Inc. Plane Ry.....com.	50	1,000,000	575,000	—	—	—	Twenty-third St. R. E. Co.....guar.	100	600,000	600,000	4½ % Q.	200	205
Cincinnati Inc. Plane Ry.....pfd.	50	150,000	150,000	—	—	—	Second Avenue RR.....	100	2,500,000	1,862,000	2 % Q., Jan.	210	212
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,000,000	2½ % Feb.	75	76	Third Avenue RR.....	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.	123½	124
Cincinnati Street Ry. Co.....	50	18,000,000	14,000,000	1½ % Q., Jan.	124½	125	42d St. Manhattan & St. Nich. Av	100	2,500,000	2,500,000	—	50	75
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,300,000	1½ % Q., Jan.	128½	129	Union (Huckelberry) Ry.....	100	2,000,000	2,000,000	—	190	200
Cleveland, Ohio.—June 3							Newark N. J.—June 3						
Acron, Red. & Clev. Elec. Ry.....	100	1,000,000	1,000,000	½ % Jan.	48	50	Consolidated Traction Co. of N. J..	100	15,000,000	15,000,000	—	67½	68
Cleveland City Ry.....	100	8,000,000	7,600,000	3½ % Jan.	100	102	North Jersey Railway Co.....	100	6,000,000	6,000,000	—	20½	21½
Cleveland Electric Ry.....	100	12,000,000	12,000,000	½ % Q., Oct.	83	84½	United Elec. Co. of New Jersey..	100	604,000	604,000	11½ % A.	26	26½
Detroit, Mich.—June 3							Pittsburg, Pa.—June 3						
Detroit Oldmens' Street Ry.....	100	2,000,000	1,250,000	—	100½	—	Allegheny Traction Co.....	50	500,000	531,000	—	27	28
Fl. Wayne & Belle Isle Ry.....	100	—	1,200,000	—	175	—	Consolidated Traction Co.....com.	50	15,000,000	15,000,000	2 % Jan.	229½	234½
Rapid Railway Co.....	100	—	250,000	—	90	100	Consolidated Traction Co.....pfd.	50	9,478,850	9,478,850	3 % Nov.	69½	68
Detroit Electric Railway.....	100	1,000,000	1,000,000	—	100	110	Central Traction Co.....	50	1,500,000	1,500,000	1½ % Nov.	78½	78½
Wyandotte & Detroit River Ry.....	100	250,000	250,000	—	100	110	Citizens' Traction Co.....	50	8,000,000	8,000,000	6 % A.	72½	73½
Dayton O.—June 3:							Duquesne Traction Co.....	50	8,000,000	8,000,000	5 % A.	—	—
City Railway Co.....com	100	1,800,000	1,470,000	1½ % Q.	140	145	Pittsburg Traction Co.....	50	2,500,000	2,500,000	3½ % Nov.	—	—
City Railway Co.....pfd	100	600,000	600,000	1½ % Q.	170	—	Federal St. & Pleasant Valley Ry..	25	1,400,000	1,400,000	2½ % July	—	—
People's Street Railway.....	100	1,100,000	1,100,000	—	114	115	Edg. Allegheny & Man. Trac. Co....	25	8,000,000	8,000,000	2½ % Aug.	—	—
							Pittsburg & Birmingham Trac. Ry..	25	1,500,000	1,500,000	1 % Oct.	41	—
							Pittsburg & West End Ry.....	50	8,000,000	8,000,000	5 % A., June	—	—
							United Traction Co.....com.	50	17,000,000	17,000,000	J. & J.	8½	18½
							United Traction Co.....pfd	50	8,000,000	8,000,000	J. & J.	51½	62

Unlisted. † Ex-div.

The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.
 a Leased to Boston Elevated Railroad Company.
 b Owned by Brooklyn Rapid Transit Company.
 c Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
 d Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
 e Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
 f Owned by Atlantic Ave. RR. and leased to Nassau system.
 g \$30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; \$250,000 of stock owned by North Chicago Street Railroad Company.
 h Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
 i 35 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,000 of stock owned by West Chicago Street Railroad Company.
 j Majority of stock owned by Chicago West Division Railway Company; 5 % on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
 k Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

Unlisted. † Full paid. ‡ Outstanding. § Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.
 b Leased to New Orleans Traction Company at 8 % on stock.
 c Leased to Central Crotona Railroad at 8 % on stock and interest on bonds.
 d Operating the former Met. Trac. system, that corporation having become extinct.
 e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
 f Leased to Houston, West Street & Pavyon Ferry—now Metropolitan Street Railway.
 g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
 h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1893, at \$215,000 per annum.
 i Leased to Metropolitan Street Railway for 18 % on stock.
 j Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.
 k Leased to Metropolitan Street Railway for \$145,000 per annum.
 l Leased to Metropolitan Street Railway for 18 % on capital stock.
 m Controlled by Third Avenue Railroad by purchase.
 n Dividends of 1½ % yearly guaranteed by Consolidated Traction Company.
 o Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.
 p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
 q Leased to Fort Pitt Traction Company for 6 % on \$3,000,000 capital stock.
 r Leased to Consolidated Traction Company for 4 % on capital stock.
 s Leased to Consolidated Traction Company for 7 % on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock.		Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital Stock.		Rate and Date of Last Div.	Bid.	Asked.
		Authoriz'd	Issued.						Authoriz'd	Issued.			
New Bedford Mass.—June 3													
Union Street Railway Co.....	100	\$850,000	\$350,000	2 % Feb.	160	165	Boston, Mass.—June 3						
Northampton, Mass.—June 3													
Northampton Street Ry.....	100	800,000	225,000	4 % A., June.	170	178	American Tel. & Tel. Co.....	100	50,000,000	28,650,000	4 % Q. Jan.	173	173 1/2
Omaha, Neb.—June 3													
Omaha Street Ry.....	100	5,000,000	5,000,000	8 % A. and N.	55	65	Erle Telegraph & Telephone Co....	100	10,000,000	10,000,000	1 % Q. Feb. 20,	87	87 1/2
Paterson, N. J.—June 3													
Paterson Ry. Co.....	100	1,250,000	1,250,000	—	54	—	New England Telephone Co.....	100	10,894,800	10,894,800	\$1.50 p. sh. Feb.	142	143
Providence, R. I.—June 3													
United Traction & Electric Co.....	100	8,000,000	8,000,000	3/4 % Oct.	110	111	New York.—June						
Philadelphia.—June 3													
Fairmount Park Trans. Co. \$50 pd.	50	2,000,000	1,770,000	2 % Dec.	28	24	American Telegraph & Cable Co....	100	14,000,000	14,000,000	1 1/2 % Q.	91	94
Hestonville, Man. & Fairmount.....	50	1,966,100	1,966,100	2 1/2 % July 15,	47	48	*Central & South Am. Tel. Co.....	100	6,500,000	6,500,000	1 1/2 % Q.	100	106
Hestonville, Man. & Fairmount.....	50	588,900	588,900	8 % July,	75	76	*Commercial Cable Co.....	100	10,000,000	10,000,000	1 1/2 % Q.	178	175
aFairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	8 % Feb. 1,	27 1/2	28	Franklin Tel. Co.....	100	1,000,000	—	2 1/2 % guar.	42	50
Union Traction Co..... \$12 1/2 pd.	50	80,000,000	29,980,450	—	30	30 1/2	Erle Telegraph & Telephone Co....	100	5,000,000	4,800,000	1 1/2 % Q. Feb.,	116	118
aElectric Traction Co.....	50	—	8,297,920	—	—	—	*Gold & Stock Tel. Co. guar. 6 %	100	5,000,000	—	1 1/2 % Q.	116	118
aCitizens' Passenger Ry.....	50	500,000	192,500	\$3 share Q.	345	—	*International Ocean Tel. Co. guar. 6 %	100	8,000,000	—	1 1/2 % Q.	8	8 1/2
aFrankford & Southwark Pass. R.	50	—	11,875,000	\$14 share A.—Apr.	450	451	Mexican Telephone Co.....	100	2,000,000	—	—	163	168
aLehigh Avenue Ry. Co.....	50	1,000,000	—	—	48	—	*New York & New Jersey Tel. Co..	100	5,000,000	3,722,000	2 1/2 % Q. Jan.,	70	75
aLombard & South Street Ry.....	25	—	1,000,000	A. & O.	90	90 1/2	*Pacific & Atlantic Tel. guar. 4 %	25	2,000,000	—	2 % S.	95	100
aSecond & Third Streets Ry.....	50	1,060,000	771,076	\$9 share A., Mar.	300	—	*Postal Telegraph Cable Co.....	100	15,000,000	15,000,000	1 % Q.	115	120
aPeople's Traction Co.....	50	10,000,000	16,000,000	8 % A., April,	150	151	*Sout'n & Atlantic Tel. Co. guar. 5 %	25	950,000	599,525	2 1/2 % S.	120	125
aGermanstown Passenger Ry.....	50	1,500,000	572,800	\$5.25 share—	151	152	*Commercial Union Telegraph Co..	25	500,000	500,000	8 % S. Jan.,	115	—
aGreen & Coates Passenger Ry.....	50	500,000	150,000	8 % Jan.,	—	—	Western Union Telegraph Co.....	—	—	97,870,000	1 1/2 % Q. Jan.	95	95 1/2
aPeople's Passenger Ry..... com.	25	1,500,000	740,000	—	—	—	*Div. guar. by Postal Tel. Co.						
aPeople's Passenger Ry..... pfd.	50	750,000	277,402	—	96	96 1/2	Miscellaneous.—June 3:						
aPhiladelphia Traction Co.....	50	30,000,000	120,000,000	\$2 p. sh. Oct.	—	—	American Dist. Tel. (Phila.).....	25	400,000	—	1 % Q.	26	27
aCatherine & Bainbridge St.....	50	—	400,000	6 % A.—Mar.	158	157	Bell Teleph. Co. (of Canada).....	100	8,960,000	8,564,000	2 % S.	188	—
aContinental Pass. Ry. guar.	50	1,000,000	—	\$6 share—July	—	—	Chesapeake & Potomac Tel. Co....	100	—	—	—	87	70
aEmpire Passenger Ry. Co.....	50	600,000	600,000	—	208	208 1/2	Chicago Telephone Co.....	100	—	—	—	200	210
aPhiladelphia City Pass. Ry.....	50	1,000,000	475,000	\$7.50 share July	100	—	Central Dist. Prtg. & Tel. Co. (Pgh.)	100	750,000	750,000	—	148	150
aPhiladelphia & Gray's Fy. RR.	50	1,000,000	298,650	\$8.50 share July	308 1/2	309	Empire & Bay States Telegraph Co.	100	—	—	—	75	76
aRidge Avenue Passenger Ry.....	50	750,000	420,000	\$12 share July,	—	—	Hudson River Telephone Co.....	109	2,000,000	2,000,000	1 % Q.	120	125
aPhiladelphia & Dark, Ry. guar.	50	—	200,000	\$2 share July,	—	—	*Northwestern Telephone Co. guar.	50	2,500,000	2,500,000	3 1/2 % Q.	122	125
aThirteenth & 15th Sts. Pass. Ry.	50	—	250,000	1 1/2 % S. July,	—	—	Providence (R. I.) Tel. Co.....	50	—	—	—	56	59
aUnion Passenger Ry. Co.....	50	1,000,000	885,000	\$11 sh. A., July,	240	240	Southern New Eng. Tel. Co.....	100	8,000,000	—	—	—	—
aWest Philadelphia Pass. Ry.....	50	1,500,000	900,000	\$9.50 shre, July,	262	268	ELECTRIC LIGHT AND ELECTRIC MFG. CO.						
				\$10 share July,			Boston, Mass.—June 3						
Rochester, N. Y.—June 3													
Rochester Railway Co.....	100	5,000,000	5,000,000	—	29	31	Fort Wayne Electric trust receipts..	—	—	—	—	115	125
Reading, Pa.—June 3													
Reading Traction Co.....	—	1,000,000	1,000,000	Semi-an. Jan. & Jy	24	26	Fort Wayne Elec. Co. T. Sec. Series A.	25	—	—	—	15	25
aCity Passenger Ry.....	50	850,000	850,000	Jan., '98.	138	—	General Electric Co. [old] .. com.	100	40,000,000	80,460,000	2 % Q. Aug., 1898.	235	235 1/2
aEast Reading Electric Ry.....	50	1,000,000	1,000,000	Jan., '98.	70	—	General Electric Co. [new] .. com.	100	18,276,000	18,276,000	1 1/2 % Q. Apr., 1901	237	237 1/2
St. Louis Mo.—June 3													
Fourth Street & Arsenal Ry.....	50	800,000	150,000	—	—	—	T. H. Elec. Co. T. Secur. Series C.	100	—	—	—	22	26
Jefferson Avenue Ry. Co.....	50	400,000	400,000	2 % Dec.	—	—	Westinghouse Elec. & Mfg. Co. com.	50	—	146,700	—	64	64 1/2
Lindell Ry.....	100	2,500,000	2,400,000	1 1/2 % Jan.	—	—	Westinghouse El. & Mfg. Co. pfd.	50	4,000,000	8,996,058	1 1/2 % Q. Jan.,	75 1/2	76
National Railway Co.....	100	2,500,000	2,479,000	1 1/2 % Jan.	—	—	Westinghouse El. & Mfg. Co. rights.	50	11,000,000	8,195,126	—	13 1/2	13 1/2
Cass Avenue & Fair Grounds.....	100	2,500,000	2,500,000	—	—	—	New York.—June 3						
Citizens' RR.....	100	2,000,000	1,500,000	4 % Oct.	—	—	Edison Elec. Ill'g Co., New York..	100	9,188,000	7,988,000	—	119	120
St. Louis RR.....	100	2,000,000	2,000,000	2 1/2 % Jan.,	—	—	*Edison Elec. Ill'g Co., Brooklyn..	100	4,000,000	2,000,000	1 1/2 % Oct., '98.	8	12
Missouri RR.....	50	2,400,000	2,800,000	1 1/2 % Jan.,	—	—	Edison Ore Milling Co.....	100	—	—	—	—	—
People's RR. Co.....	50	1,000,000	800,000	50c., Dec.	24	24 1/2	Electric Vehicle Co.....	100	—	—	—	—	—
United Electric Ry..... com.	50	500,000	500,000	—	78	78 1/2	General Electric Co. [old] .. com.	100	40,000,000	80,460,000	2 % Q. Aug., 1898.	—	—
United Electric Ry..... 5 % pref.	100	1,000,000	1,000,000	8 % Jan.,	94	95	General Electric Co. [new] .. com.	100	18,276,000	18,276,000	1 1/2 % Q. Apr., 1901	237	237 1/2
St. Louis & Suburban Ry.....	100	800,000	2,500,000	8 % A., July,	—	—	Interior Conduit & Insulation Co..	100	1,000,000	1,000,000	—	41	—
Union Depot RR.....	100	4,000,000	4,000,000	—	—	—	Kings Co. El. L. & P. Co.....	100	2,500,000	2,500,000	A. & O.	110	125
San Francisco, Cal.—June 3													
California St. Cable RR.....	100	1,000,000	600,000	50c. monthly.	117	119	Pittsburg, Pa.—June 3						
Geary Street Park & Ocean RR.....	100	1,000,000	875,000	\$2.50 share,	50	—	Allegheny County Light Co.....	100	500,000	500,000	J. & J.	108	112
Market Street Ry.....	100	18,750,000	18,750,000	Q., 60c. per share.	61 1/2	68 1/2	East End Electric Light Co.....	50	800,000	800,000	Q	—	—
Presidio & Ferries RR.....	100	1,000,000	550,000	—	—	—	Philadelphia, Pa.—June 3						
Scranton Pa.—June 3:													
Scranton Railway Co.....	50	6,000,000	2,500,000	—	29	30	Edison Electric Light Co.....	100	2,000,000	—	—	144	144 1/2
aScranton & Carbondale Trac. Co..	100	600,000	500,000	—	16 1/2	—	*Electric Storage Battery Co. com.	100	8,500,000	—	—	60	60 1/2
aScranton & Pittston Traction Co..	100	1,050,000	1,050,000	—	—	—	*Electric Storage Battery Co. pfd.	100	5,000,000	—	—	60	61
Springfield Ill.—June 3:													
Springfield Consolidated Ry.....	100	750,000	750,000	—	—	—	Northern Elec. Light & Power Co..	10	550,000	550,000	—	18	18 1/2
Springfield O.—June 3													
Springfield Street Ry.....	100	1,000,000	1,030,000	—	—	—	Southern Elec. Light & Power Co..	10	187,500	187,500	—	80	—
Springfield, Mass.—June 3:													
Springfield Street Ry.....	100	1,200,000	1,166,700	4 % A.	207	212	Miscellaneous.—May						
Toronto Canada.—June 3:													
Toronto Street Ry.....	100	6,000,000	6,000,000	1 1/2 % S.	109 1/2	110 1/2	Bridgeport (Conn.) Elec. L. Co....	25	500,000	—	—	47	48
Montreal Street Railway Co.....	100	4,000,000	4,000,000	4 % S.	279	280	Missouri-Edison (St. Louis) .. com.	—	—	—	—	20	21
Washington, D. C.—June 3:													
Belt Ry. Co.....	50	500,000	500,000	—	—	—	Eddy Electric Mfg. Co.....	25	—	—	—	9	12
Capital Traction Co.....	100	12,000,000	12,000,000	65c. per sh. Oct.	102 1/2	102 1/2	Hartford (Conn.) Elec. Light Co....	100	850,000	—	—	190	191
Columbia Ry. Co.....	50	400,000	400,000	6 % A.	85	40	Hartford (Conn.) L. & Power Co....	25	175,000	—	—	6	18
Rockington & Soldiers' Home Ry....	50	707,000	652,000	—	26	21	New Haven (Conn.) Elec. L. Co....	100	100,000	—	—	195	—
Georgetown & Tenallytown Ry.....	50	200,000	200,000	—	—	—	Narragansett (Prov., R.I.) Elec. Co.	50	1,200,000	—	2 % Q., Oct.	108	104
Metropolitan RR.....	50	1,000,000	458,900	2 1/2 % Q.	—	—	Rhode Island Elec. Protec. Co.....	100	—	—	—	118 1/2	120 1/2
Worcester, Mass.—June 3													
*Worcester Traction Co..... com.	100	8,000,000	8,000,000	—	82 1/2	35	Royal Elec. Co. (Montreal).....	—					

BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

		Amount.		Due	Interest periods.	Bid.	Asked.			Amount.		Due	Interest periods.	Bid.	Asked.
NAME.		Authorized.	Issued.					NAME.		Authorized.	Issued.				
Albany N. Y.															
Date of Quotation—June 3, 1901															
The Albany Ry. Co.....Cons. mtg. 5s		\$500,000	427,500	1940	J. & J.	117 1/4	.....								
The Albany Ry. Co.....Gen. mtg. 5s		750,000	875,000	1947	M. & N.	*116 1/4	.....								
Watervliet Turnpike & RR. 1st mtg. 5s		850,000	850,000	1919	M. & N.	*125	.....								
Watervliet Turnpike & RR. 2d mtg. 5s		150,000	150,000	1919	M. & N.	*124 1/4	127								
Troy City Railway Co.....1st 5s		.....	.....	1942	.....	*116	117								
Interest guar. by Albany Ry. Co. Principal and interest guar. by Albany Ry. Co.															
Baltimore Md.															
Date of Quotation—June 3, 1901															
United Electric Ry. Co.....1st mtg. g. 4s		88,000,000	18,000,000	1949	M. & S.	102	102 1/2								
.....Income 4s		14,000,000	.....	1949	J. & D.	74 3/4	75								
Baltimore City Pass. Ry.....1st mtg. g. 5s		2,000,000	2,000,000	1911	M. & N.	118 3/4	.....								
Baltimore Traction Co.....1st mtg. 5s		1,500,000	1,500,000	1909	M. & N.	119	120								
Baltimore Trac. Co. Exten. & Imp. g. 5s		1,250,000	1,250,000	1901	M. & S.	104 1/4	.....								
Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s		1,750,000	1,750,000	1942	J. & D.	121	121 1/4								
Bal. Trac. Co. Coll. Trust, 1st mtg. g. 5s		750,000	.....	1900	J. & J.	101	.....								
Baltimore Traction Co. Convertible 5s		800,000	.....	1906	N. & M.	109 1/4	.....								
Central Pass. Ry. Co.....1st mtg. 5s		96,000	117,000	1912	J. & J.	.....	.....								
Central Pass. Ry. Co. Cons. mtg. g. 5s		604,000	580,000	1902	M. & N.	119	121								
City & Suburban Ry.....1st mtg. g. 5s		8,000,000	8,000,000	1902	J. & D.	116	117								
Lake Roland Elev. 1st mtg. 5s		1,000,000	1,000,000	1942	M. & S.	117	.....								
*All of the bonds of the above companies, marked *, have been assumed by the United Railways & Electric Company.															
Boston Mass.															
Date of Quotation—June 3, 1901.															
Lynn & Boston RR.....1st mtg. g. 5s		5,879,000	3,702,000	1924	J. & D.	114	115								
West End Street Ry.....Deben. g. 5s		8,000,000	3,000,000	1902	M. & N.	104 1/4	106								
West End Street Ry.....Deben. g. 4 1/2s		2,000,000	2,000,000	1914	M. & S.	112	.....								
*\$1,074,000 in escrow to retire outstanding bonds of absorbed companies.															
Charleston S. C.															
Date of Quotation—June 3, 1901.															
Enterprise Street RR.....1st mtg. 5s		500,000	47,000	1908	J. & J.	.....	.....								
Charleston City Ry.....1st mtg. 5s		850,000	.....	.....	J. & J.	106	.....								
*Controlled by Charleston St. Ry. Co.															
Chicago Ill.															
Date of Quotation—June 3, 1901.															
Chicago City Ry.....1st mtg. 4 1/2s		6,000,000	4,619,500	1901	J. & J.	101 1/4	2 1/2								
Chicago Passenger Ry.....1st mtg. 5s		400,000	400,000	1908	F. & A.	.....	102								
Chicago Passenger Ry.....Cons. mtg. 5s		1,000,000	600,000	1929	J. & D.	.....	.....								
Chicago & So. Side R. T.....1st mtg. g. 5s		7,500,000	7,500,000	1929	A. & O.	.....	.....								
Chicago & So. Side R. T.....2d mtg. g. 5s		1,500,000	750,000	1907	J. & J.	108 1/4	109								
Chicago West Div. Ry.....1st mtg. 4 1/2s		4,040,000	4,040,000	1902	J. & J.	.....	.....								
Lake Street Elevated RR.....1st mtg. g. 5s		7,574,000	8,781,200	1908	J. & J.	.....	.....								
Metrop. W. Side Elev. Ry.....1st mtg. g. 5s		15,000,000	15,000,000	1942	F. & A.	96	96 1/2								
North Chicago St. RR.....1st mtg. 5s		8,171,000	8,171,000	1906	J. & J.	106	.....								
North Chicago St. RR.....Cert. Indeb. 5s		500,000	500,000	1911	J. & J.	.....	.....								
North Chicago City Ry.....1st mtg. 5s		500,000	500,000	1900	J. & J.	.....	.....								
North Chicago City Ry.....consol. 4 1/2s		2,500,000	2,500,000	1927	M. & N.	108	.....								
West Chicago St. RR.....1st mtg. 5s		4,100,000	8,969,000	1908	M. & N.	111	102								
West Chicago St. RR.....Deben. 5s		2,700,000	700,000	1911	J. & D.	101	102								
West Chicago St. RR.....Con. mtg. g. 5s		12,500,000	6,000,000	1908	.....	106 1/4	107								
W. Chicago St. RR. Tunnel.....1st mtg. 5s		1,500,000	1,500,000	1909	F. & A.	.....	.....								
*Redeemable at option on 60 da. notice. *Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee. *Subject to call after Oct. 1, 1899, at 110 and interest. *Assumed by W. Chi. RR. Co., lessee. *Int. guar. by W. Chicago St. RR. Co.															
Cincinnati O.															
Date of Quotation—June 3, 1901.															
Old New & Cov. St. Ry. 1st Cons. mtg. g. 5s		8,000,000	2,500,000	1922	J. & J.	114 1/4	115								
Mt. Adams & Eden Pk In.....1st mtg. 5s		46,000	46,000	1900	A. & O.	108 1/4	104								
Mt. Adams & Eden Pk In.....1st mtg. 5s		100,000	100,000	1905	A. & O.	114	.....								
Mt. Adams & Eden Pk In.....Cons. mtg. 5s		581,000	581,000	1906	M. & S.	108 1/4	.....								
So. Cov. & Cin. St. Ry.....1st mtg. 5s		250,000	250,000	1912	M. & S.	121 1/2	122 1/2								
So. Cov. & Cin. St. Ry.....2d mtg. 5s		400,000	400,000	1912	J. & J.	182 1/2	187								
*Assumed by the Cin. St. Ry. Co. *\$250,000 reserved to retire 1st mtg. bds.															
Cleveland O.															
Date of Quotation—June 3, 1901.															
Brooklyn Street RR. Co.....1st mtg. 5s		600,000	600,000	1908	M. & S.	106 1/4	107								
Cin. New & Cov. St. Ry.....Cons. mtg. 5s		8,000,000	2,500,000	1922	J. & J.	118 1/4	114 1/4								
Cleveland City Cable Ry.....1st mtg. 5s		2,000,000	2,000,000	1909	J. & J.	105 1/4	106								
Cleveland Electric Ry. Co. 1st mtg. g. 5s		8,500,000	1,249,000	1918	M. & S.	106	107								
Columbus (O.) Cent. Ry.....1st mtg. g. 5s		1,500,000	1,500,000	1912	M. & N.	.....	107 1/2								
Cleveland RR.....1st mtg. 5s		1,000,000	1,000,000	1910	M. & N.	.....	.....								
Wayne (Ind.) Elec. Ry. 1st mtg. g. 5s		600,000	.....	1925	M. & N.	.....	.....								
Main (O.) Street Ry.....1st mtg. 5s		200,000	200,000	1912	J. & J.	.....	.....								
Ry. Co., Grand Rapids.....1st mtg. 5s		600,000	600,000	1912	J. & D.	.....	.....								
*\$1,500,000 in escrow to retire bonds of absorbed companies, marked a. Interest guar. by Cons. St. Ry. Co.															
Detroit, Mich.															
Date of Quotation—June 3, 1901.															
Detroit Citizens' St. Ry.....1st mtg. 5s		7,000,000	8,585,000	1905	A. & O.	.....	102 1/2								
Wayne & Belle Isle Ry.....1st mtg. 5s		400,000	877,000	1902	A. & O.	.....	.....								
Detroit Ry.....1st mtg. 5s		1,800,000	1,800,000	1925	J. & D.	105	106 1/2								
*\$1,150,000 in escrow to retire bonds of City Ry. and Grand River St. Ry.															
New Haven Conn.															
Date of Quotation—June 3, 1901.															
Haven St. Ry.....1st mtg. g. 5s		800,000	600,000	1918	J. & J.	111	.....								
Haven (Edgewood Div.) 1st mtg. 5s		250,000	250,000	1914	J. & D.	111	.....								
Hester Avenue RR.....1st mtg. g. 5s		100,000	500,000	1912	M. & N.	109	.....								
Hester Avenue RR.....Deben. g		100,000	94,000	1913	M. & S.	.....	.....								
New Orleans La.															
Date of Quotation—June 3, 1901.															
Canal & Claiborne RR.....cons mtg. 5s		\$150,000	\$150,000	1912	M. & N.	.....	.....								
Crescent City RR.....1st mtg. 5s		.....	50,000	1899	M. & N.	105 1/4	.....								
Crescent City RR.....Cons. mtg. g. 5s		5,000,000	8,000,000	1948	J. & J.	.....	.....								
New Orleans City RR.....1st mtg. 5s		416,500	899,000	1908	J. & D.	108	112								
N. Orleans City & Lake RR. 1st mtg. g. 5s		5,000,000	2,599,800	1948	J. & J.	112	118								
N. Orleans & Carrollton RR. 2d mtg. g. 5s		800,000	850,000	1907	F. & A.	.....	.....								
Orleans Railroad Co.....Cons. mtg. 5s		800,000	800,000	1912	J. & J.	.....	.....								
St. Charles St. RR. Co.....1st mtg. 5s		800,000	75,000	1906	J. & D.	.....	.....								
*\$428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds. *\$200,000 outstanding.															
New York.															
Date of Quotation—June 3, 1901.															
Atlantic Ave. (Brooklyn).....Imp. g. 5s		1,500,000	1,500,000	1984	J. & J.	95	.....								
Atlantic Ave. (Brooklyn).....1st mtg. 5s		759,000	759,000	1909	M. & S.	107 1/4	110								
Atlantic Ave. (Brooklyn).....Cons. mtg. 5s		8,000,000	1,966,000	1981	A. & O.	115	116								
Broadway & 7th Ave. 1st cons. mtg. g. 5s		12,500,000	7,850,000	1948	J. & D.	128	128								
Broadway & 7th Ave. 1st mtg. 5s		1,500,000	1,500,000	1904	J. & D.	104	106 1/2								
Broadway & 7th Ave. 2d mtg. 5s		500,000	500,000	1914	J. & J.	108	110 1/2								
Broadway Surface.....1st mtg. 5s		1,125,000	1,125,000	1924	.....	115	117								
Broadway Surface.....2d mtg. 5s		1,000,000	1,000,000	1906	.....	108	106								
Brooklyn City RR. Co. 1st cons. mtg. 5s		6,000,000	6,000,000	1941	J. & J.	116	117								
Brooklyn City & Newtown.....1st mtg. 5s		2,000,000	2,000,000	1909	J. & J.	115	116								
Brooklyn Bath & W. E. RR. Gen. mtg. 5s		1,000,000	448,000	1983	J. & J.	101	.....								
Brooklyn Heights RR.....1st mtg. 5s		250,000	250,000	1941	A. & O.	104	.....								
Brooklyn, Q's Co. & Sub'n.....1st mtg. 5s		8,500,000	8,500,000	1941	J. & J.	112	.....								
Brooklyn, Q's Co. & Sub'n.....1st cons. 5s		4,500,000	2,750,000	1941	M. & N.	107	.....								
Brooklyn Rapid Transit.....gold 5s		7,000,000	5,181,000	1945	.....	108 1/4	.....								
Bleecker St. & Fulton Ferry RR. 1st mtg. 7s		700,000	700,000	1900	.....	98 1/4	104 1/4								
Cent Pk. N. & E. R. RR. 1st cons. mtg. 4s		1,200,000	1,200,000	1902	J. & D.	107	109								
Central Croton RR.....1st mtg. 5s		250,000	250,000	1922	M. & N.	125	.....								
Coney Island & Brooklyn RR. 1st mtg. 5s		800,000	800,000	1908	J. & J.	101	108								
2D Dock, E. B'd'y & B'd'y R. gen. mtg. g. 5s		1,000,000	980,000	1982	J. & D.	117	120								
Dry Dock, E. B'd'y & B'd'y R. scrip 5 1/2		100,000	1,100,000	1914	F. & A.	102	105								
Eighth Av. RR. Co.....Cert. Indeb. 6 1/2		000,000	1,000,000	1914	F. & A.	108	.....								
42d St., Man. & St. Nich. Av. 1st mtg. 5s		200,000	1,200,000	1910	M. & S.	116 1/4	117								
42d St., Man. & St. N. Av. 2d mtg. inc. 6s		1,500,000	1,500,000	1915	J. & J.	82	.....								
Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s		5,000,000	5,000,000	1908	M. & S.	124	125								
Metropolitan St Ry Co. g. m. cl. tr. g. 5s		12,500,000	12,500,000	1907	F. & A.	120	.....								
Second Avenue Ry. Gen. cons. mtg. 5s		1,600,000	1,600,000	1909	M. & N.	120	121								
Second Avenue Ry. Deben. 5s		800,000	800,000	1909	J. & J.	108 1/4	109								
Steinway Ry. (L. I.).....1st mtg. g. 5s		1,500,000	1,500,000	1922	J. & J.	116	117								
South Ferry RR. Co.....1st mtg. g. 5s		850,000	880,000	1919	.....	110 1/4	11 1/4								
Third Avenue RR.....1st mtg. 5s		5,000,000	5,000,000	1907	J. & J.	.....	12 1/4								
Twenty-third Street Ry.....1st mtg. 5s		.....	.....	1909	J. & J.	.....	.....								
Twenty-third Street Ry.....1st mtg. 5s		150,000	150,000	1906	J. & J.	106	108								
Union (Huckleberry) Ry.....1st mtg. 5s		2,000,000	2,000,000	1942	F. & A.	118	119								
Westchester Electric RR.....1st mtg. 5s		500,000	500,000	1948	J. & J.	110	114								
*\$1,085,000 in escrow to retire gen. mtg. bonds. *\$4,850,000 in escrow to retire maturing obligations. *\$552,000 in escrow to retire 1st and 2d mtg. bonds. In treasury, \$80,000. *Guar. by Union Ry. Co.															
Toronto Canada.															
Date of Quotation—June 3, 1901															
Montreal St. Ry															

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bid.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—June 31st						
Jefferson Avenue Ry.....1st mtg. 6a.	270,000	270,000	1906	M. & N.	162	1.3
Lindell Ry. Co.....1st mtg. 6a.	1,500,000	1,500,000	1911	F. & A.	167	118
Missouri RR. Co.....1st mtg. 6a.	1,000,000	700,000	1916	M. & S.	105	106
Mount City RR. Co.....1st mtg. 6a.	400,000	800,000	1910	A. & O.	104½	105½
People's RR. Co.....1st mtg. 6a.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....3d mtg. 7a.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 6a.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric 1st mtg. 6a.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 6a.	2,000,000	2,000,000	1900	M. & N.	99½	100½
St. Louis & Sub. Ry.....1st mtg. 6a.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5a.	800,000	800,000	.....	.....	80	84
Southern Electric Ry.....Cons. mtg. 6a.	800,000	800,000	1909	M. & N.	106	108
Taylor Avenue St. Ry.....1st mtg. 6a.	500,000	500,000	1918	J. & J.	116½	117½
Union Depot RR. Co.....1st cons. mtg. 6a.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.....Cons. mtg. 6a.	8,500,000	1,787,000	1918	J. & J.	121	122
†Controlled by St. Louis RR. Co.						
†Controlled by Union Depot RR. Co.						
†Controlled by Lindell RR. Co.						
†\$200,000 in escrow to retire 1st & 3d mtg.						
†\$200,000 in escrow.						
†\$200,000 in escrow to retire 1st mtg. 6a.						
San Francisco Cal.						
Date of Quotation—June 3 1901.						
California St. Cable RR.....1st mtg. 6a.	1,000,000	800,000	1915	J. & J.	114	117
Ferris & Cliff House Ry.....1st mtg. 6a.	650,000	650,000	1914	M. & S.	.....	117
Geary St. Park & Ocean RR.....1st mtg. 6a.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. 6a.	8,000,000	8,000,000	1918	J. & J.	126½	.....
Metropolitan Ry. Co.....1st mtg. 6a.	200,000	.....	.....	.....	.....	.....
Omnibus Cable Co.....1st mtg. 6a.	2,000,000	2,000,000	1918	A. & O.	126½	.....
Park & Cliff House RR.....1st mtg. 6a.	850,000	850,000	1912	J. & J.	105½	107
Park & Ocean RR.....1st mtg. 6a.	250,000	250,000	1914	J. & J.	115	.....
Powell St. Ry.....1st mtg. 6a.	700,000	700,000	1912	M. & S.	.....	125
Utter St. Ry. Co.....1st mtg. 6a.	1,000,000	800,000	1918	M. & N.	.....	.....
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—June 3 1901						
Belt Ry. Co.....Cons. mtg. 6a.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 6a.	500,000	500,000	1914	A. & O.	129	.....
Exington & Soldiers' Home.....1st mtg. 6a.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 6a.	500,000	500,000	1901	J. & J.	.....	.....
†\$50,000 in escrow to retire 1st mtg. 6a.						
Miscellaneous						
Date of Quotation—June 3 1901						
Bridgeport Traction Co.....1st mtg. 6a.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 6a.	5,000,000	8,548,000	1981	F. & A.	.....	118
C. & W. St. B. (Ind'polis).....1st cons. mtg. 6a.	4,000,000	8,000,000	1982	M. & N.	104	105
Crownpoint St. Ry. (Buffalo).....1st mtg. 6a.	8,000,000	2,866,000	1982	M. & N.	112	118
Columbus (O.) St. Ry.....1st cons. g. 5a.	8,000,000	2,261,000	1982	J. & J.	115	.....
Consolidated Traction (N. J.).....1st mtg. 6a.	15,000,000	18,965,000	1988	J. & D.	111½	111½
Crownpoint St. Ry. (Columbus, O.).....1st mtg. 6a.	2,000,000	572,000	1988	J. & D.	115	116½
Denver City Cable Ry.....1st mtg. 6a.	4,000,000	8,800,000	1920	J. & J.	20	.....
Denver Con. Tram'g Co.....Cons. m. g. 5a.	4,000,000	9,221,000	1988	A. & O.	80	85
Louisville (Ky.) Ry.....1st cons. mtg. 6a.	6,000,000	4,981,000	1980	J. & J.	119	119½
Minneapolis St. Ry.....1st cons. mtg. 6a.	5,000,000	4,050,000	1919	J. & J.	110½	110½
Minneapolis Co. Ry. (N. J.).....Cons. mtg. 6a.	8,000,000	2,378,000	1928	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.).....3d mtg. 6a.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.).....Deb. 6a.	500,000	489,000	1902	F. & A.	.....	.....
No. Hudson (N. J.) Ry.....Cons. mtg. 6a.	1,250,000	1,000,000	1981	J. & D.	.....	.....
Paterson (N. Y.) Ry.....1st mtg. 6a.	8,000,000	2,000,000	1980	A. & O.	.....	.....
Rochester (N. Y.) Ry.....Cons. g. 5a.	5,500,000	4,298,000	1987	.....	105½	106
St. Paul City Ry.....Cons. g. 5a.	8,000,000	.....	.....	.....	.....	.....
St. Paul City Ry.....Deb. g. 6a.	1,000,000	1,000,000	1900	.....	108	.....
†\$1,000,000 in escrow to retire 1st and 2d mtg. 6a.						
†\$500,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
†\$750,000 in escrow to retire bonds of O. St. RR. Co.						
†\$87,000 in treasury.						
†\$500,000 reserved to redem prior liens						
†\$500,000 in escrow.						

*With Int' res

ELECTRIC LIGHT AND ELECTRIC MFG. CO.

Boston, Mass.						
Date of Quotation—June 3 1901						
Delaware Gas Lt. Co.....1st m. 5a. g.	800,000	800,000	.....	J. & J.	106	106
Edison Elec. Illuminating Co., Boston.....	2,026,000	.....	.....	Quar.	167	.....
General Electric Co., gold coup. deb. 5a..	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa.						
Date of Quotation—June 3 1901						
Allegheny County Light Co.....6a.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Scrip. 6a.	195,570	.....	.....	M. & S.	.....	.....
Miscellaneous. —(June 3 1901.)						
Edison El. Ilig. Co. (N. York) 1st m. 5a..	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilig. Co. (N. Y.) con. m. g. 5a.	15,000,000	2,188,000	1998	.....	124	.....
Edison Elec. Ilig. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	124½	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5a.	2,500,000	.....	1937	A. & O.	100	105
Kings Co. El. Lt. & Po. Co. pur. money 6a.	5,176,000	.....	1997	A. & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5a.	8,000,000	.....	.....	F. & A.	102½	.....
United Elec. Light & Power Co. (N. Y.)...	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—June 3 1901						
American Bell Telephone.....4a.	.....	.....	1908	F. & A.	100½	101
Northwestern Telephone Co.....7a.	.....	.....	.....	.....	.....	.....
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 6a.	.....	.....	.....	.....	114	115
Chesapeake & Potomac Teleph. Co.....6a.	.....	.....	1911	J. & D.	108	108

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—June 3 1901.						
American Electric Heating.....7a.	500,000	500,000	.....	.....	.....	25
Armington & Sims Engine Co.....6a.	.....	.....	1942	J. & J.	106	107
Barnes & Smith Car Co.....6a.	.....	.....	1904	J. & D.	.....	.....
Carborundum Mfg. Co.....6a.	75,000	.....	.....	.....	118	127
Worthington Pump Co.....† (omitted).	.....	.....	.....	.....	.....	.....

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 17@17½c.; Lake, 17½@17½c.; casting, 16½@17c.

The General Electric Company is putting up a \$250,000 office building in Schenectady.

It is reported that the Chicago Union Traction Company will not ask the city council for an extension of its franchises.

Philadelphia Bell Telephone stockholders have approved the increase in capital stock from \$6,000,000 to \$8,000,000.

Chicago Union Traction stock has been somewhat more active on the New York Stock Exchange recently than for some time past.

Chicago Telephone directors have declared a quarterly dividend of 3 per cent. and voted to increase the capital stock from \$8,000,000 to \$9,000,000.

The annual meeting of the Empire State Power Company will be held in Amsterdam, N. Y., June 11, when directors and officers of the company will be elected.

It is stated that the Lehigh Valley Traction Company, which controls and operates the Easton (Pa.) Transit Company's lines and other trolley roads in that vicinity has been absorbed by the Union Traction Company of Philadelphia.

President Insull, of the Chicago Edison Company, is quoted as saying that there is no truth in the report that his company is to be absorbed by the People's Gas Company, and that it is not probable a merger will be effected.

Stockholders of the New York Gas, Electric Light, Heat and Power Company, and the stockholders of the Edison Electric Illuminating Company have voted favorably on the proposition to consolidate with each other, the vote being practically unanimous.

At the first meeting of the incorporators and stockholders of the recently organized Edison Storage Battery Company, held Friday at Newark, N. J., Thomas A. Edison was elected president and John F. Randolph secretary and treasurer. The election of directors was deferred.

The following are quotations for some of the industrial stocks not quoted elsewhere: Electrical Lead Reduction, 3¼@4; Electric Boat, 19½@20; Electric Vehicle, 10½@12½; Tel. & Tel. Company of America (full paid) 5@6½; Electric Company of America, 8¼@8½; National Carbon, 15¼@16.

An electric power plant will be built at Lake Linden by the Calumet & Hecla Company to furnish power to operate the six heads of stamps to be installed in the addition to the stamp mill, which is now being built. The engine, Gratiot, is being converted to supply power, and other machinery is being constructed for the plant.

The directors of the Washington and Annapolis Electric Railway have effected a permanent organization. W. H. Lamprecht was elected president, Otto Miller secretary and treasurer and James Christy vice-president. The directors are: W. H. Lamprecht, Otto Miller, Frank N. Wilcox, F. T. Pomeroy and E. W. Moore, of Cleveland; James Christy, Jr., of Akron, O., and Wm. L. Marbury, of Baltimore. The company will soon open working offices in Washington. Surveyors are locating the route. The line from Baltimore to Washington will be a little more than 30 miles long.

At a special meeting of the stockholders of the American Telephone and Telegraph Company on Monday, held at the New York Office of the Company, it was voted to increase the capital stock from \$100,000,000 to \$150,000,000. Fifteen stockholders were present. The \$50,000,000 increase was authorized by a unanimous vote of the 709,560 shares represented at the meeting. President Cochrane says: "The natural growth and expansion of our business demands the increase which has been authorized. In order to avoid the inconvenience of having to call another special meeting at some future date, it has been deemed expedient to ask for an increase of \$50,000,000 at this time. This increase will enable us to extend our lines wherever a profitable business can be done." Of this \$50,000,000 increase, \$21,000,000 will be offered to stockholders at par, each holder of three shares of old stock having the right to subscribe for one share of new stock. The first payment will be called about August 1, and the second about January 1, 1902. A circular will be issued to stockholders during the latter part of the week.

Announcement of default of interest and plans for reorganization of the Washington Traction and Electric Company was issued June 1 by the majority bond holders. The reorganization committee consists of George W. Young, chairman; John C. Brown, James Timpson, William H. Hollister, Gardiner M. Lane. The offices of the bondholders' committee will be at No. 59 Cedar street, New York. The Washington Traction and Electric Company controls all the electric railways in the District of Columbia except the lines of the Capital Traction Company. It also controls the electric lighting plants. The stock and bonds of the company are mainly owned by New York people. The failure to pay the interest renders the company liable to foreclosure. The earning capacity never has been equal to the demands. The company was organized two years ago with a capital of \$12,000,000 in stock and \$20,000,000 in 4½ per cent. bonds. Its property consists of the stocks of eleven street railroads and two electric lighting companies in Washington. The deficits in the company's revenues have been made good at each successive period by those largely interested, and, it is understood, through an assessment on the stock. Saturday's action is attributed to some large holders, including Messrs. Hayward, of Baltimore, Scott, of Wilmington, Del., and F. C. Stevens, of this city, selling their stock. The purchasers, it is reported, are the Roebings, of New York. It is supposed that a floating debt has been accumulated. Some conjecture that this has reached a million dollars or more. George W. Young, one of the majority bondholders, estimates that it would be four or five years before the receipts of the company on its present basis would meet the operating expenses and fixed charges.

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EDITORIAL NOTES.

Pennsylvania Demands Rapid Transit.

Much speculation and considerable discussion has been aroused over the recent action of the Pennsylvania Legislature in passing two bills with lightning rapidity, providing for rapid transit through the construction of elevated or underground railways in the large cities of the Commonwealth. The bills were passed by the Senate and House with but few dissenting votes. Neither political nor factional lines were drawn in the struggle—and the sum and substance of it all is that there will be an enormous demand for electrical apparatus from the large cities of Pennsylvania.

The passage of the bills will enable local authorities to take up the matter of rapid transit immediately, and to act upon any propositions that may be presented for the improvement of the street railway systems of Philadelphia, Pittsburg, or any other city in the State.

It is an undeniable fact that Philadelphia is behind the times, particularly so far as street traffic is concerned. To be sure good service has been furnished by the Union Traction Company of that city, but nevertheless the street corners are daily crowded with people waiting for cars, and the congested condition has forced the public to demand rapid transit.

Other cities have struggled with the same problem, and by a combination of roads—elevated and underground—rapid transit was provided, and the existing surface roads gained considerably by looking after the short-distance rider. The experience of New York, Chicago, Boston and London with a dual or triple system of transit may be cited to show that neither elevated or underground roads affect surface roads disastrously. Statistics show that when surface roads are properly managed and run on business lines the result has proven beneficial. The Metropolitan Railroad of this city in long-haul competition with the Manhattan Elevated illustrates this.

The large cities of Pennsylvania need rapid transit badly, and already there is a rush to Harrisburg by prominent attorneys of responsible corporations seeking charters to build double track and elevated roads in Philadelphia and Pittsburg. The public demand for rapid transit must be met—and of course there

are corporations without number who are willing to serve and satisfy the public.

* * *

Meeting of the Independent Telephone Association.

The Fifth Annual Convention of the Independent Telephone Association of the United States is now being held at Buffalo. That the selection of that locality for holding the meeting this year was a most admirable one is only too apparent, in view of the Pan-American Exposition. Here the delegates will have an opportunity of inspecting the latest electrical devices, including telephone apparatus, besides enjoying the sights generally, which many of them would probably have missed had not the meeting place been Buffalo.

Judging from the programme of the convention—which will be found on another page of this issue—it will prove the most instructive and important yet held. As usual the papers to be read are few in number, but this is no disadvantage, as it permits of each paper being carefully and thoroughly discussed, which is at times impossible at conventions where many papers are crowded into a session. The paper by Charles E. Wilson on "Independent Telephone Development East of the Alleghenies" should prove interesting as well as that entitled "Bell Methods." The latter should prove extremely interesting reading, if some of the methods pursued by the monopoly in Western towns are thoroughly gone into. The days of the Bell monopoly are limited, and as the Independent companies have forced the trust to the wall in many localities throughout the West, so will the Independents gradually force the monopoly to reduce rates in the East, in gaining the good will and hearty support of the public, as aptly illustrated by our cartoon which appears on page 359. Actions speak louder than words, and as we have warmly supported the Independent telephone movement in the past, so will we continue to aid the telephone cause with our best efforts in the future.

* * *

Mexican Trade.

The subject of Mexican trade and how to secure it is one of wide extent, and no one person possesses the knowledge of all the details of each branch of trade which would enable him to discuss the subject thoroughly and intelligently. The co-operation of merchants dealing in articles about

which information is sought is necessary, and this co-operation is seldom possible to obtain, as comparatively few Americans are engaged in business in Mexico. The trade is largely in the hands of Mexican, German, French and English houses, and these, although not apparently against the United States, are not enthusiastic advocates of trade expansion between the United States and her sister republic. That our electrical machinery is in fine favor there is evidenced from the large increase in the value of the importations during the fiscal year 1900, when the total value of the imports amounted to \$445,208, against \$131,730 for the preceding year. A slight falling off in the imports of scientific instruments, including telegraph, telephone and other electric apparatus, was noticeable in 1900, the value for that year being \$424,637 against \$429,188 for the preceding year.

In view of the healthy condition of our electrical trade with Mexico and the apparent desire of our manufacturers to participate more largely in the trade of that country, a few suggestions relative to that fertile field may not be without general interest at this time.

All shippers should see to it that their shipments are properly classified and entered in accordance with the Mexican custom-house tariff, and that the necessary Mexican consular invoice is taken out. Our manufacturers may be inclined to think such work superfluous and hesitate to take time and care in the methodical packing and listing of the goods, but if such care be taken when shipping the goods a world of delay, and, in many instances, fines by the custom house authorities are avoided. A manufacturer who has goods to sell will make a friend of his customer by forwarding goods in the best possible manner and listed in accordance with the laws of his customer's country.

Every manufacturer seeking trade in Mexico, should familiarize himself with the Mexican tariff. The duties are specific, and except in a very few cases, all importations pay duty by weight. Weights are of three classes—gross, net and legal. The first two are self-explanatory, but legal weight is especially a feature of the Mexican tariff, and is the weight of the article, with the wrapper, box, or whatever it may be that is next to the article, i. e., not the main outside covering, but that inside. Each package should bear its mark and number, so it can be distinguished easily, and old marks and numbers should be erased, for there is a fine for each package having more than one mark, or number, or if these do not correspond with those indicated in the consular invoice. Consular invoices and manifests should be carefully prepared as the slightest error involves the liability of a fine.

The metric system is the legal standard for weights and measures in Mexico. Our English weights and measures are stumbling blocks to the Latin countries whose trade we seek. The persistent use by our manufacturers in their catalogues, circulars, etc., of our old English weights and measures causes us to lose considerable trade with Mexico and the other Latin-American countries, on account of their being unintelligible to many foreign buyers. It would be well for our manufacturers desiring to extend their trade in Mexico and other countries using the metric system to base descriptions of their goods and estimate prices upon this metric system.

The subject of commercial credits is one of

the most important things effecting trade with Mexico. The credit system prevails throughout the republic and the practice is so firmly fixed all over the country that only a few things can be sold upon a cash basis.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

ELECTRICAL experts estimate that the total undeveloped energy of Niagara Falls is 8,000,000 horse power.

JUDGE THOMAS, President of the Independent Telephone Association, says "the future of the telephone business amounts almost to a question of how soon manufacturers can supply apparatus and material to supply the villages and towns not now covered. At the present time the business is growing faster than it can be taken care of, and there is hardly a large company in the country but what has many subscribers on the waiting list, simply because instruments cannot be secured to connect them up at once. The work in many towns is being held up for the same reason. The question of finance no longer troubles people who are well known as responsible and experienced promoters. The recent decision on the Berliner patent case has done much toward clearing the atmosphere, and together with the remarkable showing made by some of the companies has furnished capitalists with the assurance that telephone investments are safe and fruitful."

At a conference held in Albany, N. Y., on Saturday last between the board of directors of the United Traction Company and committees representing the employees of its Albany and Troy lines, the differences which have sprung up between the company and its employees during the past two weeks were amicably settled and all chances of a strike happily averted. The suspended conductors were reinstated with pay and the other matters in dispute settled to the satisfaction of the company and its employees.

A REPORT from Providence, R. I., states that the new trolley freight service which the Suburban Railroad Company inaugurated but a short time ago has met an enthusiastic welcome from the store keepers down in the Pawtuxet Valley. The merchants along the line were quick to appreciate this service, realizing the convenience of having fresh goods delivered quickly at their doors.

THE programme for the convention of the Canadian Electrical Association, which commences its sessions at Ottawa, Ont., on the 19th inst., is a somewhat elaborate one, and promises to be very interesting and enjoyable to those who avail themselves of the opportunity to attend the convention. The papers to be read at the meetings of the Association include the following: Professor Owens, of McGill University, Montreal, "Transformation From Constant Potential Alternating to Constant Current Alternating." J. R. Robertson, Montreal, "The Influence of the Lead Factor on the Design and Operation of a Lighting and Power System." K. B. Thornton, Montreal, "Notes on Construction and Protection of Aerial Transmission Lines." O. Higman, Ottawa, "Dominion Electrical

Standards." Mr. H. S. Doherty, of New York, and A. E. Slade, of Quebec, will also read papers the former dealing with the subject of rates for electric lighting. The Minister of Inland Revenue has tendered an invitation to the members of the association to examine the Government electric standards.

NIAGARA FALLS is to have another new and interesting electric furnace process for the manufacture of an abrasive to be used in the manufacture of wheels, hones, paper, etc., for which emery, carborundum and other materials are at present used. This new artificial abrasive will be made, it is understood, by fusing bauxite, which is one of the ores out of which aluminum is made.

A SHORT time ago the construction of the new system of the Mountain Telegraph Company, between Colorado Springs and Denver, Col., under the superintendency of E. E. McClintock, was begun from three separate points. It is proposed to build about 2,000 miles of telegraph line, but in no way will the new company be a competitor of the Western Union.

CHICAGO capitalists are to introduce wireless telegraphy for commercial purposes in Chicago within forty or fifty days. Preparations for installing wireless telegraph and telephone instruments in the States of Illinois, Michigan, Minnesota, Iowa and Wisconsin are now being made and within a short time wireless telegraph stations are to be established at various points in those States.

THE sixth annual convention of the International Association of Municipal Electricians will be held in the Natural Food Company's Convention Hall, Niagara Falls, N. Y., Monday, Tuesday and Wednesday, September 2, 3 and 4, 1901. The following papers will be read: "The Need and Value of a Set of Rules for Outside Construction," P. H. Trout, Jr., of Lynchburg, Va.; "Underground Electrical Constructions, From a Municipal Standpoint," Edward F. Schurig, Omaha, Neb.; "The Protection of Fire and Police Telegraph Wires From High Tension Currents of Lightning," W. M. Petty, Rutherford, N. J.; "Improved Storage Battery for Municipal Purposes," J. W. Aydon, Wilmington, Del. Papers will also be read by well-known electrical engineers dealing with the advisability of placing high and low potential conductors in the same conduits or man-holes.

THE State Department at Washington has received information of the opening for traffic of the first electric suburban railroad in Russia. It connects the manufacturing city of Lodz in Russian Poland with the neighboring towns of Zgierz and Pabianice, is 13½ miles long, and cost \$560,000. The charter provides that the Russian Government shall receive a share of the profits, shall have the right to purchase after twenty years, and that the road intact shall become Government property at the expiration of 28 years' time.

MR. YERKES when interviewed in London on June 6 is reported as saying: "We have practically got control of the London Underground Railway. That is what it amounts to. My syndicate is composed of both British and American financiers, although far the greater portion of the capital comes from the United

States. We hope to begin work in a few months, as soon as the necessary consent of Parliament has been obtained. The system we intend to install is almost exactly similar to that in use on the elevated lines in Chicago. We will sell the present antiquated cars and substitute those of an American pattern. We intend to rebuild the stations, to install arc lights and make the road equal to any rapid transit line in the world."

LONDON advises state that American manufacturers have secured the contract for electric engines on the Swiss railway up Mount Zermatt.

FROM reports transmitted by Consul General Guenther it is learned that a new electrical company, the Sociedad General Gallego de Electricidad, has been formed in Madrid, Spain, with a capital of 2,000,000 pesetas, and two of its engineers, Messrs. Ernesto Preser and Adolfo Barbe of Madrid, have been instructed to procure the necessary machinery. Another company has also been formed at Saragossa, the Sociedad de Aprovechamiento del Rio Gallegos, with a capital of 3,500,000 pesetas. This company will require a great deal of machinery and apparatus.

THE first decennial banquet of the Chicago Electrical Association held last week was productive of several addresses by members of the society and others, illustrating the great progress of electricity in the last ten years and its present influence in every channel of human intelligence. The speakers also dwelt on the immense advantages enjoyed by students in technical schools at the present day.

THE Borsig Company of Berlin, one of the largest machinery firms of Germany, lately dispatched its American employes to Ceylon to erect electrical plants, amounting in value to more than \$1,000,000. All this machinery comes from the United States.

A TROLLEY accident quite similar to the one that occurred at Leonia, N. J., a few Sundays ago, is reported from Syracuse, N. Y. While rounding a curve at full speed on the afternoon of June 5, a car on the Lakeside trolley line tipped over. There were fifty passengers on board, and half of them were injured. The usual excuse of the brakes failing to work is given as the cause of the accident.

THE New York Electric Vehicle Company, by acquiring control of the recently organized Metropolitan Express Company and through a contract with the Metropolitan Street Railway Company of New York, will shortly transport baggage from one point of the city to another. Electric trucks will connect with the baggage cars at convenient points to distribute the packages to their addresses.

PASSENGER traffic on all the surface car lines in Williamsburg, and also a large section of the western district of Brooklyn, including the bridge was put to serious inconvenience on the morning of June 5, by the burning out of the armature of a dynamo in the power house of the Brooklyn Rapid Transit Company, in Kent avenue, near Division avenue. There are six generating machines in the Kent avenue power house and the increase power demanded

by the heavy morning traffic proved too much for generating machine No. 6. Its breakdown threw an additional load on the other five generators, which were already taxed to almost their limit. The result was that the automatic circuit breaker was blown out and the power cut off.

TELEPHONE MEN AT BUFFALO.

Large Gathering of Independents—An Interesting Programme and Many Attractive Telephone Exhibits

As we go to press all arrangements have been completed for the holding in Buffalo of the Fifth Annual Convention of the Independent Telephone Association of the United States. The meeting, which is expected to be the most successful and the most largely attended yet held, convenes on June 11 and adjourns on June 13. As will be seen by a glance at the programme which follows there are a number of very interesting papers to be read,

troit, Mich., and T. J. Fricker, Ashtabula, O. Paper by Charles E. Wilson, Philadelphia, Pa., subject, "Independent Telephone Development East of the Alleghenies." Discussion by C. E. Stinson of Rochester, N. Y., and Senator C. W. Lline of Hazleton, Pa. Reports from various States and other business.

In the afternoon inspection of exhibits by manufacturers in connection with headquarters at the Iroquois Hotel, Pan-American Exposition and Niagara Falls.

THURSDAY, JUNE 13.

At 10 A. M., third session of the convention at Convention Hall. Reading of paper by H. D. Critchfield of Cleveland, O., subject, "Legislation and Litigation." Discussion by Ed. Kibler of Newark, O., and C. S. Bush of Fort Wayne, Ind. Reading of paper by E. B. Fisher of Grand Rapids, Mich., subject, "Bell Methods." Discussion by George W. Beers of Fort Wayne, Ind., and W. A. Bisbee of Savannah, Ga. Election of officers and unfinished business.

The officers of the Association are: James M.



THE ONLY BELLE THE INDEPENDENTS CARE FOR.

which will no doubt elicit full discussions that should prove of benefit to the members.

That the independent movement has proven such a success is due no little to the untiring efforts of Judge Thomas and others who have given their best efforts to the success of the cause.

At the gathering in Buffalo there will be no lack of entertainment features as a goodly number of the fair sex are expected to be present. The programme in detail is as follows:

TUESDAY, JUNE 11.

Reception of delegates, distribution of badges, tickets, etc., at headquarters, Iroquois Hotel.

At 12 o'clock opening of the convention in the banquet room of the City Convention Hall, Virginia and Elmwood avenue. Address of welcome. Response by President James M. Thomas. Annual address by the president.

In the afternoon inspection of exhibits made by manufacturers in connection with headquarters at the Iroquois Hotel.

WEDNESDAY, JUNE 12.

At 10 A. M., second session of the convention at Convention Hall. Paper by Hon. S. P. Sheerin, Indianapolis, Ind., subject, "Village Exchanges, Farmers' Line, Rates and Other Lessons." Discussion by J. B. Ware of De-

Thomas, president, Cleveland, O.; H. C. Young, first vice-president, Columbia, Pa.; C. E. Stinson, second vice-president, Rochester, N. Y.; H. E. Teachout, third vice-president, Des Moines, Ia.; S. P. Sheerin, secretary and treasurer, Indianapolis, Ind.; R. F. Johnson, first assistant secretary, Saginaw, Mich.; Sam E. Wayland, second assistant secretary, Wilkes-Barre, Pa.

New York Electrical Society.

At the annual meeting of the New York Electrical Society, held on the evening of June 6, the following officers were elected: President, Arthur Williams; Vice-Presidents, C. E. Knox, C. O. Baker, Jr., S. L. Nicholson, H. A. Lardner, George Herbert Condict, H. V. Parrell; Secretary, George H. Guy; Treasurer, Henry A. Sinclair.

Northwestern Electrical Association.

The summer meeting of this association will be held at Sheboygan, Wis., commencing on Wednesday morning, June 26. Reports and papers on subjects of special interest to central station men will be read and discussed. An attractive entertainment programme is being arranged, and a pleasant and profitable time is assured to all who attend the convention.

CALCULATING THE STRENGTH OF STEAM BOILERS.

BY W. H. WAKEMAN.

This article like many others that I have written was suggested by ideas that were expressed by correspondents, some of which do not fully grasp the meaning of rules that are given us for determining the strength of boilers, while others are based on the discovery of faults that is not easy to remedy.

Taking the tensile strength of the iron or steel, of which the shell of a tubular boiler is made, into consideration, I would say that while writers who wish to illustrate the application of rules frequently assume that the tensile strength of the plate is 50,000 pounds per square inch of sectional area, it does not mean that this is to be taken as the strength of all plates used. Some of them may run as

are wholly without the benefits accruing from judicious legislation properly administered.

Under this undesirable state of affairs it is plain that all we can do is to assume a tensile strength for the plate in the boiler that we wish to calculate the strength of and proceed to solve the problem. This is the weakest point in the whole plan, and there seems to be no efficient remedy for it.

Many boilers that are now made for land purposes have the tensile strength of the plates stamped near the center of the front head, just above the tubes, so that it is well for an engineer to look for it here when he begins to calculate the strength of a given boiler.

In the absence of this mark the conditions must be taken into consideration and an estimate made. If the plate is of iron, made by a reputable maker and claimed to be the best brand of iron plate, it is safe to assume that

hundreds of boilers do not possess more than 60 or 65 per cent. of the full strength, and when a greater strength than this is assumed it is encroaching on the margin of safety.

On the other hand, some of the joints that are used in steam boilers intended for high pressures have 80 or perhaps 85 per cent. of the full strength, therefore it is not proper to calculate on 70 per cent. and limit the pressure to the result obtained on this basis. The process of calculating the strength of a double welt, butt joint is rather complicated, but a little study and the application of standard rules for boiler joints will soon straighten out the problem.

Only a small part of the bursting pressure is taken as the safe working pressure, as it usually ranges from $\frac{1}{4}$ to $\frac{1}{3}$ of it. When an engineer wishes to determine the safe pressure he divides the bursting pressure by 4, 5 or 6, as his



JAMES MILTON THOMAS,
President of the Independent Telephone Association of the United States.



GEORGE W. BEERS,
Prominent Member of the Independent Telephone Association.

low as 40,000 or less, while others exceed 60,000 pounds.

Engineers wish to know how to determine the actual tensile strength in every case, and to this proposition I can only say that the proper way to determine this is to put a piece of the plate into a testing machine, pull it asunder and note the result. I am well aware of the fact that this is seldom practical, as engineers do not usually include a testing machine in their kit of tools, and manufacturers seldom or never put in one of them for general use.

The United States Government has made provisions for this important factor, because all of the boilers under its jurisdiction can be controlled, but land boilers in the several States are not under control of one set of laws, but are either partly controlled by various laws of more or less value as the case may be, or else

the tensile strength is 50,000 pounds. If it is made of steel, under similar conditions the strength may be taken at 60,000 pounds. There are few boilers made at the present time that have but a single row of rivets in the longitudinal seams, but where one of them is found it does not necessarily mean that the strength of the joint has 56 per cent. of the strength of solid plate. A good single riveted joint has that percentage, but it is much better to take the diameter and the pitch of rivets and calculate the actual strength of the joint, wherever it is possible to obtain these dimensions.

A good joint with two rows of rivets will show 70 per cent. of the strength of solid plate, but it is a very great mistake to assume that every kind of a joint that has two or more rows of rivets in it has just 70 per cent. of the full strength. Joints that are used in

judgment dictates, and the number used as a divisor in such a case is called the "factor of safety." Some writers have called it the "factor of ignorance," and I sometimes think that this is a proper name for it, because it is meant to cover possible defects that we are ignorant of, for if we were positively sure that the bursting pressure of a certain boiler is 600 pounds, I know of no reason why it should not be considered safe at 300 pounds in every day use, for an actual margin of 300 pounds is certainly enough to satisfy even the most cautious engineer. I am quite sure that hundreds of boilers are run on a margin that is very much smaller than this, although there is no way of determining this except by putting on pressure until the boiler fails. My reasons for thinking that the margin in many cases is much less than we calculate on are not only on account of possible defects, but because when

the conditions are right for it the material of which a boiler is made loses its strength as time advances.

As an illustration of this fact I will mention a case where an inspector struck a "through and through" brace in a tubular boiler with his testing hammer and it dropped into two pieces. This brace was undoubtedly much stronger than when it was first put into service, but long continued vibration and changes in its tension had finally crystallized it and made it unfit for use.

Because 5 is very commonly used as a factor of safety, some readers conclude that it is a number arbitrarily fixed, but this is not correct, for it is left to the best judgment of the engineer to decide what number shall be used.

The factor used on United States Government boilers is practically 4, when considered on a basis equal to that on which other boilers are rated, taking 5 as a factor of safety.

For illustration, the bursting pressure of a 66 inch boiler is 477 pounds and using 5 as a factor of safety the safe pressure is 95 pounds. The United States Government rule allows 113 pounds as the safe working pressure of such a boiler, which shows that the factor of safety is about 4. A skillfully made boiler is safe in either case when new, and after it has been used for ten years it is safer carrying a pressure that is determined by the smaller factor, provided it is used and cared for in an intelligent manner, than it is if only allowed a pressure determined by the larger factor and placed in the care of ignorant and careless firemen.

SIGNAL CORPS MEN IN THE PHILIPPINES.

BY "MECHANIC,"

At present with U. S. Signal Corps, Panay, Philippine Islands.

The long felt want of additional Signal Corps men for the Philippine service does not appear to abate. The continuance of guerrilla warfare in the interior of nearly all the islands is what is keeping the line men busy, and the operators are at it night and day. The wear and tear on the members of the corps is not so very great, as one might suppose, but the work is by no means easy and therefore every means possible is taken by the Government officials to offset this by making the remuneration as much as possible and still keep within the law. The Signal Corps men of the Philippines are given all the "extras" possible and they earn them. I have been associated with the line men in a number of enterprises in the jungle and know that every one of them is worthy of his profession.

At the present time there are about 30 officers engaged in the signal service of the Philippines, but with the lines being extended everywhere and in every direction about as fast as the line men can erect them, the work of the officers is on the increase, for they have to inspect all lines and see to it that the connections are maintained within their sections. I know of several officers whose territory is now so extensive that even with fast horses they cannot get from point to point as fast as required for purposes of inspection and directing new work or repairs to old. They must therefore depend to a large degree upon their assistants who are usually first class sergeants. These sergeants are generally well qualified as they are the men who have worked up through the different grades from private to first class private, thence to

corporal, sergeant, and finally first class sergeant, which is as high as they can get, unless it be as chief operator, before they secure a commission, and the latter, of course does not come at all except after long term of service and hard work and study. I know of some who have studied nights for months in view of taking the examinations for a commission.

One of the most perplexing problems to take



SIGNAL MEN READY TO PUT UP A POLE.

up the time and attention of the Signal Corps people is the new lines which are constantly being called for as fast, in fact, as new points are garrisoned by American troops. These new lines call for all of the necessary equipment to carry on the work either by telephone or by telegraph wire, and supplies are difficult to obtain in these islands. The United States Government has been shipping large quantities of telegraph and telephone supplies to these islands for several months and to look upon the vast heaps of appliances which are landed upon the wharfs at the seaports in readiness for the interior, one would suppose that the line men were being provided with all that is needed to put up a line and get it into operation hastily. But this is not always the case. There are always parts missing and considerable delay is caused in obtaining them. In the meanwhile the persons wanting the lines are bothering the line men about the delay. I have seen line men go to work and put up sev-



SIGNAL CORPS WAGON CROSSING A STREAM IN WET SEASON.

eral miles of wire with every other insulator left off owing to shortage of insulators.

The intention is to go over the line later and put on the insulators, but somehow the proper time never arrives and the line is handicapped thereby. Then again there is a dearth of proper instruments. There seems to be a shortage in every need and it would pay some dealer and manufacturer in telephone and telegraph supplies to have agencies on the various islands garrisoned by the troops for no other purpose than to supply the devices required to the military and private concerns. The latter

are now cutting quite a figure in the archipelago and several companies have been formed by sugar mill men, miners and rice-field operators for the purpose of erecting lines to the seaports from the interior. The miners are making money on Luzon, Mindanao, Panay and Negros and they are using some of it in the equipment of telegraph lines to assist them in the working of their business. There is considerable work going on in the private lines and before many months there will be a good demand for operators for these lines.

Here in the Philippines the telegraph operator is required to be something of a mechanic. Take for example the post where your correspondent is at present stopping. It is a sort of a central station and the troops occupy what was formerly a Spanish convent. The building is large, erected of stone and there is a nice room set off for the telegraph operator. Lines run into this building from all directions, and both telegraph and telephone instruments are employed. Only one American operator can be spared for this office under the circumstances and he is provided with several native assistants to care for the lines, carry the messages, etc. There ought to be a night operator, but there are not enough men to furnish the day force. This operator, like all of the others on the islands is obliged to do considerable mechanical work about the instruments, and hardly a day passes that he is not required to go out afoot or in the saddle from one to five miles for the purpose of locating breaks in the wire, due to storms, or the rebels cutting the wires on the poles. Then there is the mechanical work on the instruments.

This is a hard climate on the mechanism of the instruments and I have seen them thrown out after a few months' service because of the thick crusts of rust which have accumulated on the parts and which prevent the free operation of the same.

In the convent in question they seem to be taking out old and putting in new instruments every few months and in each case the instruments are fit only for the junk pile. This happens in instances where there is lack of proper care of the instruments more so than when the parts are freely wiped and oiled at intervals. Operators who are stationed in isolated offices away from the inspectors should be mechanical enough to keep the parts of the instruments clear from rust by applications of oil, and frequent brushing and wiping.

The hours of line men, telegraph operators and others connected with offices in the United States are usually so regulated that the work is not tedious. In this country there can be no regular time of rest specified, for the reason that there are not men enough in the force to permit either operators or line men to have a "lay off." Evidently this trouble will be rectified in course of time, but operators who enlist for the Philippines should bear in mind that there is work before them. The work, however, is usually exciting, and your correspondent knows of several operators in this vicinity who prefer the Philippine service. There is no lack of novelty and trouble. Many an operator will tell of the many times he has been shot at while working an instrument attached to one of the poles. The native soldiers are fully aware of the importance of the messages sent over the lines in war times and they try to prevent the sending of as many as possible by cutting wires, tearing down the poles and cut-

ting them into little pieces and by shooting into the quarters of the operators. The insurgent sharp-shooters sometimes get positions in trees on elevations a mile or so from a station, and having first secured the plan of the station open fire on the portion occupied by the telegraph operator. As soon as the firing begins, the troop forms and charges the position of the

maintain a toll bridge. The location selected was about on the line of ferry, running from the foot of Ferry street, Portland, to a point on Bridge street, Middletown, about one-sixth mile above the railroad depot. It is 800 feet up stream from the railroad bridge and 300 feet below the end of Willow Island. It will be seen that the position of the island, with the

from the sea, there is a tide of 2½ feet, and the highest known water-mark is 25 feet above low-water. The floor of bridge was placed 6 feet above the last elevation, making the distance from floor to low-water 31 feet. At low tide the depth of water in the channel is 16 feet.

Superstructure.—The width of bridge selected is that required for two lines of carriage travel and one line of electric cars. This requires 26 feet center to center of trusses. Provision is made on the floor beams for connecting sidewalk brackets in the future. The floor of bridge is designed to carry a load of 100 pounds per square foot—14 ton electric cars or a 10 ton wagon. The trusses are proportioned for a live load per foot of bridge of 1,500 pounds for chords, and 2,000 pounds for web. The material used was iron for eye bars and lateral rods, and the balance, excepting machinery, is medium steel. The allowable unit stresses are:—

Tension iron eye bars.....	12,500 lbs. per square inch.
Iron lateral rods.....	15,000 " "
Steel plates and shapes.....	15,000 " "

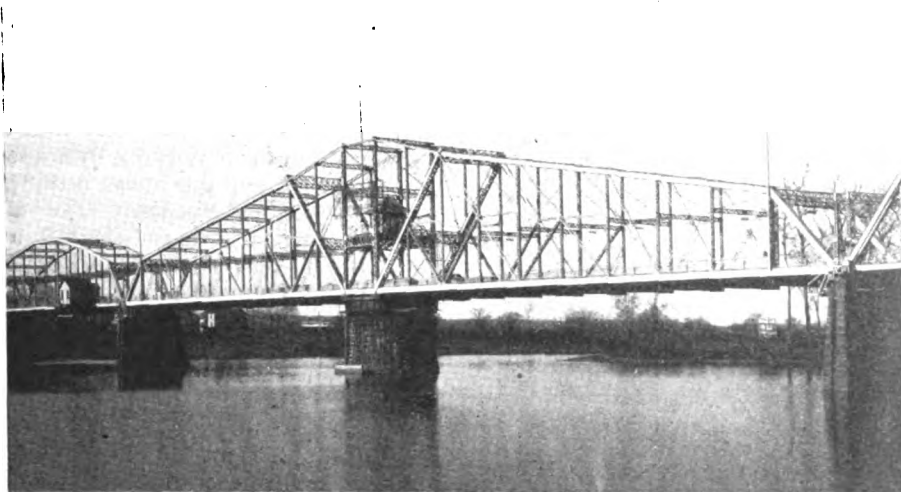
12,500

1

Compression —
1 + 18,000 r.

Fiber stresses on steel beams....	16,000 lbs. per square inch.
" " yellow pine beams.....	1,350 " "
Bearing on pins and rivets....	16,000 " "
Bending " " ".....	22,000 " "
Shearing " " ".....	8,000 " "

The bridge throughout has a wooden floor, consisting of 4 inches by 14 inches yellow pine joist vulcanized, spaced 2½ feet apart, and two layers of spruce plank. The lower is 3 inches thick, kyanized, laid diagonally, and the upper 2 inches thick square across. Both layers are dressed on one side. The stringers for the



MIDDLETOWN (CONN.) BRIDGE.

Largest Highway Draw Span in the world.—H. G. Tyrrell, engineer, Boston.

sharp-shooters and the latter makes for the jungle, and usually escape.

A man who has held the position of line-man, operator or other position in the Philippines is certainly well equipped for service in other countries, for here he gets the brunt of everything. I have heard many of the men say that they are crowding more experience into one year than into any three years in the United States. Here they are hard at it constantly. All sorts of experiences arise which are of benefit to the men owing to the practice they get. Often in sending messages the delicate touch of the Spanish spy can be noticed, he having broken into a message. Again the spies of the enemy often practically wreck an office and the operator upon his return is obliged to develop his mechanical ability by attempting to bring the distorted parts of the office equipment out of the ruins. The operators in the central stations are kept on the jump all the time and their ability to quickly handle difficult cases is therefore developed.

SWING BRIDGE AT MIDDLETOWN,

The Longest Highway Drawbridge in the World—Operated by Electricity.

BY H. G. TYRRELL,
Boston.

The new highway bridge across the Connecticut River, at Middletown, Conn., is 1,300 feet long, with a 26 foot roadway, and provision for two 6 foot sidewalks. It contains the longest highway swing span in the world. Beside the street traffic it carries a line of electric railway, connecting Middletown with Portland. It consists of—

Two fixed spans.....	200 feet, center to center of piers.
Two " ".....	225 " " " "
One draw ".....	450 " " " "

Up to the time of building the bridge in 1896, communication between the two towns had been kept up by means of ferries. The amount of travel seemed to warrant the construction of a bridge, so that the Middletown and Portland Bridge Company was formed to build and

channel on the west side, required the draw span to be about in the center of the river, thus making a symmetrical arrangement for the spans. The Government required two clear waterways of 200 feet each, which fixed the length of swing at 450 feet. This is believed to be the longest highway swing bridge in the world. A comparison table is given below. This table does not include a number of long-



VIEW OF OPERATING MACHINERY OF MIDDLETOWN BRIDGE.

span railroad drawbridges that have a highway attached:

Middletown Bridge.....	450 ft. long
Macomb's Dam Bridge.....	412 " "
Third Avenue Bridge.....	300 " "
Harlem Canal Bridge.....	270 " "
Cleveland Bridge, in two spans,...	279 " "
Charlestown Bridge.....	240 " "

Notwithstanding its being thirty miles

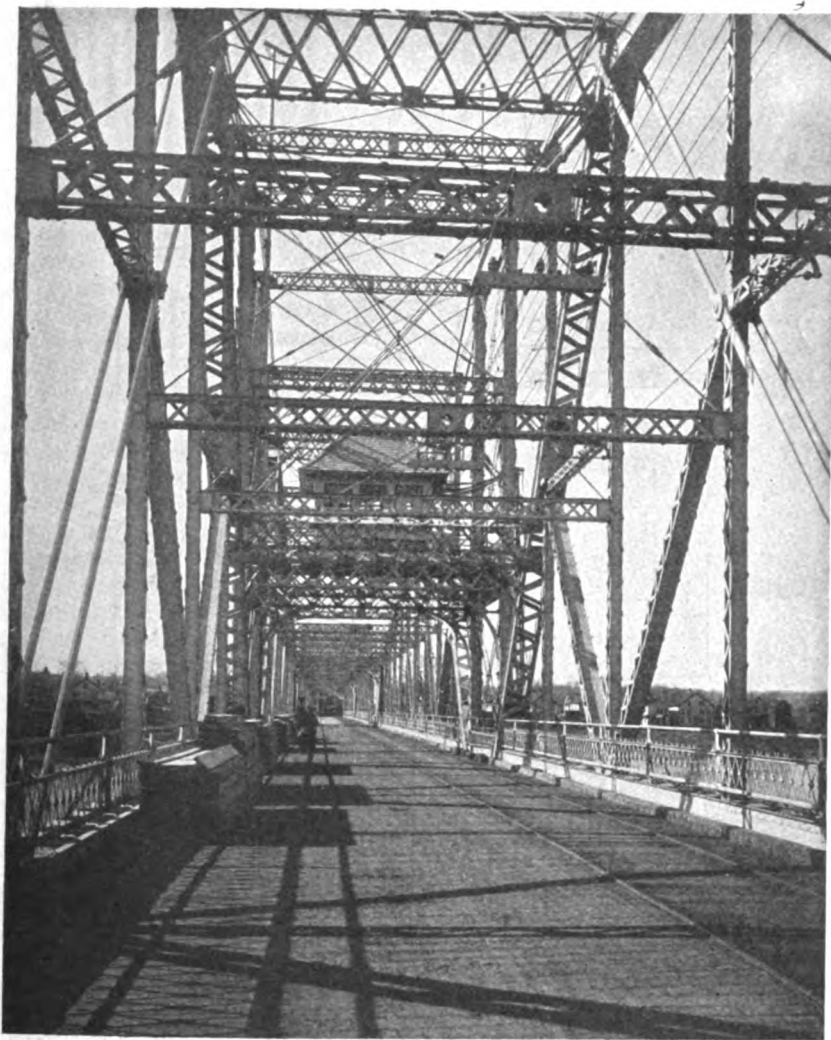
car track are 15 inch steel beams, weighing 42 pounds per foot. On each side of the road is a lattice railing with a 1½ inch pipe top. The proportions selected for the trusses are:—

200 fixed span.....	12 panels	depth 21 ft. to 27 ft.
225 " ".....	12 " "	" 21 ft. to 27 ft.
450 draw ".....	20 " (at 21 ft. 3 in.)	" 21 ft. to 25 ft.
	1 " (at 22 ft.)	

The turn-table is entirely rim bearing. Eight loading beams transfer the weight to

sixteen points on the drum, which is 4 feet deep, and 31 feet diameter. This stands on sixty-four cast steel wheels, 8 inches by 16 inches, which run between cast steel beveled treads 2 inches thick at the center. The lower tread rests on wrought steel plates bolted to the masonry. This arrangement of turn-table makes a simple construction, and is believed to be as effective for a highway draw as some of the more elaborate combinations of rim and center bearing turn-tables, which depend on their adjustment for an even distribution of load. The drum and wheels are secured in place to a center casting by means of the usual radial braces and spider frame. This center casting is set down 6 inches into the

center tower. It has large windows on four sides, and an overhanging sunshade eave. The walls and floor are double thick, and it is provided with electric heat for cold weather. The platform is reached by means of a ladder from the bridge floor. It was originally intended that the closing of the gates should be done by the operator in the tower, and, in fact, the author of this article made a complete design for electrically-worked steel safety gates. While these would cost \$950 for the two gates, they would do away with the service of two gate operators, but on account of an accident to the substructure involving extra expense, the steel gates and some other machinery were omitted.



LONGITUDINAL VIEW OF MIDDLETOWN BRIDGE.

stone pier, and secured to it by means of eight bolts, 1½ inches diameter and 6 feet long, built solid into the pier. This casting has a hollow center for the passage of wires up to the bridge.

The swing is operated by three 25 hp. electric motors of railroad type, one for turning and the other two for blocking up the ends. Besides these there is a fourth motor and a duplicate set of turning machinery all in place, which can be used in case of unbalanced wind pressure or a break in the other machinery. These two sets can be worked independently or together, at the will of the operator. Power is taken from the Middletown street wires, and a cable is laid on the river bottom and brought up on the center pier. This passes in a groove under the wheel track and up through the center casting. The operating house stands on an overhead platform in the

This last was an arrangement for closing the space between the ends of rail, where the draw and fixed span join. In cold weather this opening is liable to be 2 inches or more. As this would cause a serious jar to cars, and possibly a derailment, the author had designed machinery to close this space, while the toggles were tightening. There is also a lifting steel apron plate to cover the curved openings in the floor at the end of draw, to lift up before the bridge is opened. Instead of the moving rail, an ordinary split rail is used that can be adjusted occasionally with the changing seasons, and instead of the safety gates, a pair of temporary wooden ones are now in use.

As already stated, the blocking up of the ends is done by two separate motors at the ends of draw placed beneath the floor. It is not infrequent to bring power from the center by means of a shaft; but the writer's experi-

ence shows that for long draw spans this method is not satisfactory, as too much power is lost by friction in the boxes. The calculated deflection of the ends was 3½ inches, and after the bridge was completed and levels taken the actual deflection was found to be 3¼ inches.

Blocking up the ends is done by means of a pair of toggles at each corner. These are drawn together by two bronze nuts working on a right and left-hand screw, that is turned by bevel gears from the motor. To prevent these nuts from jamming there are electric signals that tell the operator when to shut off his power. As a general rule it is intended to simply block the ends up tight. This requires but very little power. But as there is always the liability of the blocks becoming tight from change of temperature or other causes, the end machinery was proportioned to lift 50 tons at each corner, 1¼ inches in ten seconds. This required 10 hp., but it was thought best to use the same kind of motor used at the turn-table, giving interchangeable parts. To provide for expansions, the end toggles rest on cast steel rockers of 17½ inches radius, which in turn bear on cast-iron pier plates, blocked up to the right elevation with shims. The floors of fixed span and draw were made to level up, by notching the joist.

The latch is an extra heavy swinging gravity latch, to which is attached a line of No. 10 wire passing over pulleys to the center and connected by means of bell cranks with the operator's house.

To open by electric power takes 30 seconds, and the power required to overcome an unbalanced wind pressure of 5 pounds per foot on one-half of bridge is 30 hp. Ordinarily, however, in calm weather 5 hp. is sufficient to turn. It was necessary to use about four times the amount of resistance ordinarily used on street car work with the same motors. The reason for this is evident when the relative weight of bridge and car is considered. Both the center and end sets of machinery are provided with clutches, which can be thrown out of gear, and the operation performed by hand power. Working on 10 foot levers, the bridge is turned by four men in eight minutes. There is a friction brake applied to a drum on the highest speed turning shaft. This and the other turning machinery, including the motor, are placed on the outside of drum beneath the floor in a machinery frame that can be sheathed in and protected from snow and ice. The whole bridge is well lighted with incandescent lamps, and has also the usual signal lights required by the Government.

BATTERIES USED IN TELEPHONY.

BY F. KERR HIGGINS.

This subject has not received the attention it deserves, and the result is consumers continue to change from one style to another without keeping any record of their tests, and after considerable waste of money, loss in efficiency, etc., they return to the old standard types. It is to be expected that in the desire for higher efficiency, we should try new types, but in doing so we must keep a careful record of the results obtained. In order to do this a low-reading voltmeter of a standard type should be used, and regular tests made under conditions found necessary to be fulfilled by the battery wanted. It is to be regretted that more care is not taken in selecting batteries, and still more, that, having once se-

lected them, they do not get the high efficiency from them they should. This is partly due to lack of proper literature on the subject, and also to carelessness in following the instructions from manufacturers. That batteries form an important factor in efficient telephone service will not be denied, nor the fact that high efficiency can only be had by having first a suitable battery and then by maintaining it properly. In local battery systems, the work of maintaining them is often relegated to a student, who is not always the most careful in his work. He usually thinks his work unimportant; his interest decreases with the monotony, and he eagerly looks forward to a change, not realizing that he is neglecting a splendid opportunity for studying a very important branch of the business. In common battery systems this is overcome by having a large storage battery at the central office constantly under the eye of an expert. Where this is not so, greater damage can be done by negligence and ignorance than in the local battery system, but the investment is so great that companies usually provide a good man to take care of their accumulators. The attention necessary is very little, but must be constant and thorough. That the talking in a common battery system is not as good as in a local battery system up to full standard is admitted, but it is, as a rule, more uniform and superior to the average local battery system.

In telephony, batteries are divided into two separate classes, known as primary and secondary. We will treat first the primary cell, but, before doing so, it will not be amiss to define some of the terms to be used: Current (*c*) is electricity in motion and its unit is the ampere; electromotive force (EMF.) is the pressure forcing the current, the unit being the volt; resistance may be defined as the hindrance placed in the path of the current, the unit being the ohm. The relation of each to the other is clearly defined in Ohm's Law: "The strength of the current in any circuit is directly proportional to the electromotive force developed in that circuit, and inversely proportional to the resistance in the circuit, this is usually expressed as follows: $C = \frac{EMF.}{R}$

EMF. = $C \times R$ and $R = \frac{EMF.}{C}$." Electrolyte is the

liquid contained in the cell (commonly called the exciting liquid). The electrodes or poles of a battery (or cell) are the metallic terminals (or conductors) attached to the plates, separately they are called the anode and cathode. It should be remembered that the polarity of the element acted upon by the electrolyte is the opposite sign to its electrode, e. g., the wire attached to the zinc pole is — sign while the zinc itself is + sign. This should be watched as it sometimes causes confusion and trouble in arranging cells of a battery so as not to oppose each other. A primary battery may be defined as a number of cells so arranged as to form a single source of electric supply. Almost all local battery systems have primary cells at the subscriber's stations.

We know electricity will flow away from a charged body through any conducting substance to ground or on a short circuit, and that a current always flows through such a medium if the ends are kept at different potentials, therefore we will assume, for convenience, that electricity flows from a positive to a negative. It is also obvious that if (in any

way) electricity could be supplied as fast as it was used, we would have a continuous current; such currents, so far as this paper is concerned, are supplied or derived from a battery. The contact of dissimilar metals (as copper and zinc) are known to produce a current, these are sometimes called voltaic elements, and a voltaic battery is a number of these properly arranged and connected together. If we take a piece of pure zinc and put it in sulphuric acid it is attacked very slightly by the acid; but if the ordinary zinc is used, it is attacked more strongly and sulphate of zinc is produced, hydrogen gas is liberated (as can be seen in the small bubbles which rise to the

produce the current, one of the metals must be readily oxidizable, and zinc (pure) is found to serve the purpose best, and is used in all primary cells. The electrolyte also must be such as will act readily on this metal, but is not the same in all cells, as will be noticed in the descriptions. It is well to notice here that in a good cell when the circuit is open (on open circuit cells) no current should flow and no chemical action should take place, and when this latter does exist it is generally due to impurities in the zinc or weak depolarizing substance or liquid, and is termed local action. Amalgamating the zinc (covering it with a coating of mercury), done by immersing it in

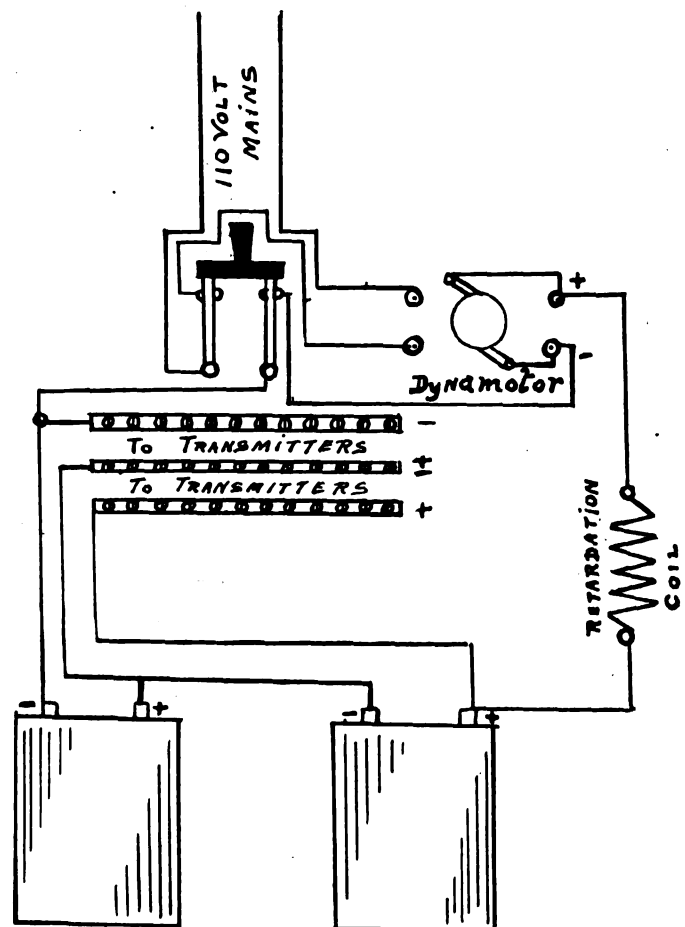


FIG. 1.

Storage Battery and Charging Machine. EMF. at cell terminals, 2 volts; capacity, 24 transmissions.

surface from around the zinc), the water is decomposed and the liquid becomes hot. Now insert, with the zinc, another piece of metal, this time using copper, and touch the two together at the outer end, and the action is increased. The bubbles of hydrogen now forming around the copper element before coming to the surface. It will be observed that the heat produced when only the zinc was in the acid now disappears and the energy expended is turned into electricity, as can be seen by making a voltmeter or electrometer test. It will also be observed that one of the elements becomes positive and the other negative. The zinc copper plate and liquid will be + when circuit is open, but when closed the copper will be — and the zinc + under the liquid and the opposite sign at the electrodes, the current flowing from the + to the —. The electricity is held in the cell until the contact of the dissimilar metals, that the current flows is demonstrated by, (1) heat produced, (2) affecting a magnetic needle laid along its path, (3) decomposes water, (4) magnetizes, etc. In order to

Fuller solution, or other strong acid to clean it, and then in mercury will greatly reduce this and also be a saving of zinc. Where a copper wire is used to connect to the zinc and passes through the electrolyte, as in Fuller cell, this also should be coated with mercury.

Polarization is known as the formation of hydrogen bubbles on the copper (or carbon) plate and has a tendency to weaken the current by increasing the resistance to its flow and setting up an opposing EMF. to the original current. Three methods have been used to counteract this, chemical, mechanical and electrochemical, e. g., a highly oxidizable substance added to the liquid, such as nitric acid, chloride of lime, potash, etc., air blown into the cell and the surface of the plate made rough. A good primary cell then will embody most, if not all, of the following requirements:

1. Low internal resistance.
2. Recuperate quickly.
3. EMF. constant.
4. Free from local action or polarization.
5. Construction cheap and easily renewed.

6. Interior of cell always exposed to view.
7. Electrodes protected from fumes, gases, and electrolyte.
8. Should be lasting and not readily exhausted.

The internal resistance of a cell can be increased or decreased by varying the size of the plates, also by bringing them nearer to each other and by using suitable liquids.

The Leclanché cell is perhaps the most popular of all cells because of its simple construction, and it very nearly fulfills all the requirements stated; this is especially serviceable for transmitters of low resistance, such as the Blake and modifications of it. This form of

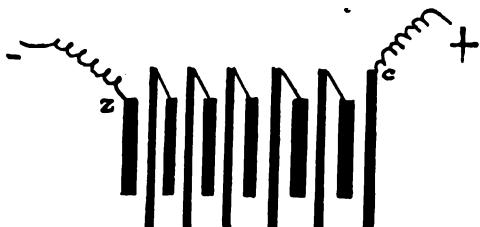


FIG. 2.—DIAGRAM SHOWING CELLS IN SERIES.

cell has zinc carbon elements with an electrolyte composed of water and sal-ammoniac (chloride of ammonia NH_4Cl), the depolarizer being peroxide of manganese (MnO_2), contained in a porous cup (or sack); this latter slowly yields up oxygen, thus destroying the hydrogen bubbles. It is very constant and lasting, and, properly cared for, gives good results when a strong current for a long period is not necessary. The average resistance is about 4 ohms, but the porous exterior of the cup must be kept in good condition to keep the resistance down to this figure. The quality of the sal used is very important and should be watched carefully and each lot tested. The ordinary sal usually contains lead, which forms crystals around the zinc (much in the same way as the use of too much sal), this grows and finally short-circuits the cell, exhausting it the same as a piece of wire connected directly across the electrodes. A good simple test for the quality of the sal is to pass it several times through the flame of a Bun-

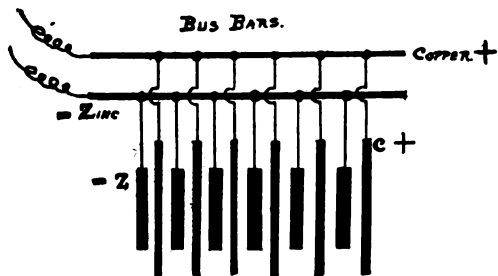


FIG. 3.—DIAGRAM SHOWING CELLS IN MULTIPLE

sen burner or an inspector's soldering torch and observe the sediment left. In pure sal there should be none and the quality will be in proportion to the amount left. The pure sal in this test passes off in white fumes which are unpleasant and should not be inhaled. The salts very frequently creep over the glass jar, and can be prevented by dipping the mouth of the jar in hot paraffin. The amount of sal necessary is about five ounces. It is real economy not to use cast zinc in this cell, but only that cut from rolled sheets. The amount of zinc consumed is about twenty-five ampere hours' per ounce of pure zinc. The EMF. is 1.5 volts, the porous cup becoming discolored (rusty color) is a sure sign of exhaustion. The

contacts at the poles should be clean, tight and well protected as they corrode very readily, increasing the resistance of the circuit. Always keep the glass jar clean that you may readily observe the condition of the cell.

DRY CELLS.—These are very frequently used and have been tried over and over again, but so far I have never seen any that gave satisfactory results in telephone work. The theory is good and may yet be successful, but for the present I do not find it true economy to use them. The trouble is they will not stand hard work like the Leclanché, cannot be depended upon, recuperate very slowly and some of them not at all; they generally give out suddenly and without notice, a fatal fault in telephony. The internal resistance is usually high and many of them polarize very badly.

THE LEE FULLER CELL.—Where a stronger current is necessary, this cell gives perhaps the best results, the only drawback being in handling the solution, which is very injurious to clothing, carpets, etc. This has been overcome by the introduction of a powder called "votak," put up in tin boxes and very convenient, but the results obtained from its use are not as good as by using the solution supplied in carboys. This solution (electroton fluid) is a bichromate solution, composed of sulphuric acid two parts, water four parts and potassium bichromate one part, this latter is dissolved separately in boiling water and, when hot, is mixed with the other ingredients. All parts are measured by weight, and the solution may be diluted to suit requirements. The cell consists of a glass jar, porous cup, zinc (with wire attached) and a carbon plate, the whole being covered with a wooden top, which also serves to keep the elements apart. In setting up, pour into the porous cup a small portion of mercury (about the size of a dime) then add just a pinch of common salt, into this is placed the conical zinc (wire and zinc previously well amalgamated), then fill up porous cup with soft water till within two inches of top and place the whole in the glass jar, pour solution all round it and to the same height as the water in the porous cup; into this outer solution (through the top) place the carbon plate, pass wire connected to zinc through top and close down, and cell is at once ready for use. The resistance of this cell is about 1.25 ohms, and the EMF. 2.1 ohms, and is well suited for the average long distance transmitter, two of them being connected up in series. In renewing do not attempt to use the old solution if it is of a very dark color, but clean out the whole cell thoroughly, saving the mercury and the zinc, if not too far gone. These, or some form of them, constitute standard cells for open circuit work.

GRAVITY CELL.—This form of cell is really the only one worth considering for closed circuit work. The most popular form is the crow-foot, deriving its name from the peculiar form of the zinc. It is a form of Daniell cell, and depends on the difference in specific gravity of the two liquids to keep them apart. It is a curious fact that when the current is flowing through the cell the chemical action keeps the two liquids separate, but if for any reason the current ceases to flow, they gradually intermix, and, copper sulphate forming, comes in contact with the zinc and produces local action exhausting the cell. To avoid this, they should be used only on closed circuit work, for which they are specially adapted. In setting up this cell, spread out the copper so as to form a six-pointed star, straighten out the wire at-

tached to copper and bend end over outside of glass jar (this wire should be insulated with good rubber) allowing the copper to rest on the bottom of the jar, drop the crystals (lumps) of sulphate of copper (blue vitrol) between and all around the leaves of the copper; about two lbs. is sufficient for one charge. The jar is generally eight inches high and six inches wide. The copper is made up of three pieces of sheet copper two and one half inches long, riveted together in the center, so that when spread out it forms a six-pointed star. The zinc usually weighs about three pounds and is shaped like a crow's foot, and is hung on the tip of the jar by a lug provided for that purpose.

All the elements being in position, pour in some clean, soft water until the zinc is covered; then leave cell on short circuit for five or six hours before using, or if it must be used at once, add a little sulphate of zinc, being careful not to put in the zinc element until the solutions have separated, known by the lower solution becoming a deep blue color, and the upper clear. The EMF. of this cell is about 1.1 volts and the internal resistance about .5 ohm. The maintenance of this cell is very simple, it being only necessary to add from time to time a few copper crystals as the deep blue color fades or gets below the level of the copper element. Occasionally it will also be necessary to draw off a little of the zinc sulphate and replace it with soft water; apart from this, the cell should be disturbed as little as possible. It is scarcely necessary to consider other forms of the Daniell cell as this one is standard, can be relied upon and all others are on the same principle.

Primary batteries are usually costly in materials, but when once set in operation require very little care. They are, in many systems, an absolute necessity, and few systems (if any) exist where there are not some in use. In many systems the closed circuit battery is no longer a necessity for use on switchboard transmitters as they are superseded by dynamo-electric machines or accumulators (Fig. 1). In telephony the amount of current necessary is very small, and almost any good cell, with a voltage from one to two volts, will serve the purpose on low resistance transmitters; and a battery (more than one cell) of from three to four volts for long distance transmitters. In the selection of cells, attention should be given to the mechanical construction; all materials should be of the best quality, all binding posts firmly fixed to the elements, they should be well protected from contact with the electrolyte and fumes from same. In setting up, all the available surface should be made use of, leaving only enough of the elements exposed to connect to leading in wires, in this way a great saving in materials is effected and the life of the battery prolonged. It is found, in practice, useless to try to save any of the substance left after the action of the battery, as the cost of collecting is not found to justify its accumulation.

CONNECTING UP CELLS.—When several cells are connected together in series (Fig. 2) of same size and kind, their combined resistance would be that of one cell multiplied by the total number and their EMF. would be found in same way. When connected in parallel (or multiple) (Fig. 3) the total resistance would be one cell divided by the total number and the EMF. that of one cell.

It will be seen, from the foregoing, that if the external resistance is small it will do no good to increase the number of cells in series if

more current is desired, as the resistance increases as fast as the EMF; neither will any perceptible increase in current be observed if the external resistance is high and cells are added to in parallel, as the resistance remains nearly the same and the EMF. is stationary.

The best methods of connecting up cells can be obtained by applying Ohm's Law, already

given: $c = \frac{EMF}{R}$, and the following rule: The maximum current will flow when cells are so grouped that the internal and external resistances are equal. It is therefore necessary in installing to pay close attention to the resistance of the circuit and the cells so that they may be grouped to the best advantage.

(To be concluded.)

COMMERCIAL PARAGRAPHS.

The Farr Telephone & Construction Supply Company, 118 and 120 Jackson Boulevard, Chicago, has on hand at all times a line of high grade telephones and supplies of different kinds, which it might be well for intending purchasers to examine. This well-known concern has magneto bells for bridging or series of

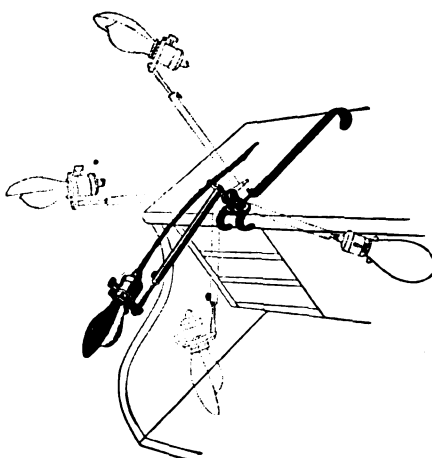


FARR TELEPHONE COMPANY NO. 4 BI-POLAR RECEIVER—VERY STRONG MAGNETS.

from 15,000 to 100,000 ohms resistance. Its switchboards embody the most up-to-date types and the very best workmanship. That the telephone apparatus of the Farr Company is fully appreciated by the trade may be inferred from the fact that forty county telephone lines in the State of Illinois alone are using its telephones to say nothing of numerous exchanges in other States. A catalogue may be obtained by addressing the company as above.

Something New in a Desk Lamp.

The Smith & Hemenway Company of 296 Broadway, New York City, is introducing the Ferguson Adjustable Lamp Bracket, which is one of the most novel and up-to-date roll-top desk lamps on the market. It is adjustable to any size roll-top desk or upright piano and can be fastened on without the assistance of screws or nails. The reflector can be placed at any desired angle to prevent a glare in the eyes. It is ornamental because it is handsomely finished in enamel and nickel. It is the most reasonable priced lamp on the market, and at the same time, very durable. It is simple in construction and operation, and is quickly adjusted. There are no springs to get out of order or make bad contact. The accompanying cut illustrates a few of the angles at which it can be placed.



Illustrated matter and circulars of the lamp will be furnished to parties desiring same.



ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED JUNE 4, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

- 675,522. Trolley-Pole. Charles Nicholson, Springfield, Mass. Filed Sept. 5, 1900.
- 675,523. Street-Car Fender. George A. Parmenter, Cambridgeport, Mass. Filed Aug. 23, 1900.
- 675,580. Car-Fender. Charles W. Adams, Washington, Pa. Filed Jan. 25, 1901.
- 675,667. Electric Brake for Railway-Cars. Frank C. Newell, Wilkinsburg, Pa., assignor to the Westinghouse Air Brake Company, Pittsburgh, Pa. Filed March 28, 1900.
- 675,668. Electric Brake. Frank C. Newell, Wilkinsburg, Pa., assignor to the Westinghouse Air Brake Company, Pittsburgh, Pa. Filed April 28, 1900.

ELECTRIC LIGHTS AND APPLIANCES.

- 675,598. Adjustable Protecting Device for Electric Lamps. Edwin J. McAllister, Almon D. Page and Louis C. Warner, Newark, N. J., assignors to William Farley Brewster, New York City. Filed Feb. 28, 1901.
- 675,427. Electric Heater for Electric Glow-Lamps. John Van Vleck and William N. Stevens, New York City. Filed April 27, 1900.
- 675,599. Electric-Arc Lamp. Daniel Higham, Winthrop Highlands, Mass., assignor to the General Electric Company of New York. Filed Nov. 21, 1900.
- 675,640. Apparatus for Removing Electric-Light Bulbs. Frederick H. Renaud, Wilkes-Barre, Pa. Filed Jan. 2, 1901.

ELECTRICAL MACHINERY AND APPARATUS.

- 675,517. Controller for Electric Motors. Frank A. Merrick and Emmett W. Stull, Johnstown, Pa., assignors to the Lorain Steel Company of Pennsylvania. Filed Aug. 28, 1900.
- 675,518. Armature Ventilation. Frank A. Merrick, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Oct. 25, 1900.
- 675,557. Electric Igniter for Explosive-Engines. Walter H. Cotton, Chicago, Ill., assignor of one-half to Albert Kunze, same place. Filed May 21, 1900.
- 675,614. Electric Switch. Johan M. Andersen, Boston, Mass., assignor of one-half to Albert Anderson, same place. Filed Jan. 17, 1900.
- 675,675. Armature and Magnet Adjusting Device for Relays or Other Electric Instruments. Ulysses G. Rogers, New York City. Filed March 5, 1901.
- 675,811. Equipment of Electric Cranes. Henry Burrell, Glasgow, Scotland. Filed Oct. 1, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

- 675,377. Signaling Device for Telephone-Switchboards. Harry C. Dodge, Cleveland, O. Filed Dec. 21, 1900.
- 675,378. Pay-Telephone. Charles E. Egan, Durham, N. C. Filed March 15, 1901.
- 675,487. Telephone Speaking-Tube or Like Receiver. Hahnemann A. Cutmore, Lee, Eng. Filed March 31, 1900.
- 675,685. Extension-Bell for Telephones. Vandiver J. Van Horn, Keokuk, Ia. Filed April 12, 1900.

MISCELLANEOUS.

- 675,379. Automobile. Rollie B. Fageol, Des Moines, Ia. Filed Sept. 11, 1900.
- 675,383. Automatic Electric Cut-Out. Frank E. Greenstreet, Holborn, and Edwin J. Selby, Birmingham, Eng. Filed June 12, 1900.
- 675,390. Battery-Casing for Motor-Bicycles. Robert M. Keating, Middletown, Conn., assignor to the R. M. Keating Motor Company, Portland, Me. Filed Dec. 8, 1900.
- 675,419. Galvanic-Battery Cell. Carl T. Sittig, Gross-Lichterfelde, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed May 11, 1899.
- 675,447. Insulating Pipes. John M. McMahon, Omaha, Neb. Filed Jan. 28, 1901.
- 675,455. Process of Manufacturing Lead Salts by Electrolysis. John B. Tibbetts, Hoonick, N. Y.; Le Grand C. Tibbetts administrator of said John B. Tibbetts, deceased. Filed March 6, 1894.
- 675,532. System of Electrical Distribution. Lewis B. Stillwell, New York City. Filed Feb. 14, 1901.
- 675,586. Electrical Storage Battery. William J. Buckley, Chicago, Ill. Filed July 5, 1900.
- 675,600. Storage Battery. George W. Hough, Evanston, Ill. Filed Dec. 20, 1900.
- 675,615. Insulator. Johan M. Andersen and Albert Anderson, Boston, Mass. Filed Jan. 31, 1901.
- 675,643. Electric Time-Switch. Oscar Springer, Springfield.
- 675,653. Electric-Bell Mechanism. Walter E. Foster, Carnegie, Pa., assignor to the Sargent Automatic Railway Signal Company, Rochester, N. Y. Filed Dec. 8, 1899. || Mass. Filed Oct. 16, 1900.
- 675,708. Battery-Tray. James R. Blackwell, New York City. Filed Feb. 15, 1901.

This is one of the young and enterprising houses in the tool line and has forged its way forward in the past few years so that the majority of the old houses have begun to wonder from what part of the country they came. They are the publishers of one of the most novel catalogues issued by any house that we know of. It is known as the "Green Book of Hardware Specialties." A copy of same will be sent free upon application.

THE TELEPHONE WORLD.

To Oppose the Bell Telephone Company's Underground System.

S. P. Sheerin, president of the Independent Telephone System of Indianapolis, Ind., has begun negotiations for opposing the Bell Telephone Company's interests in the gas belt. He proposes to launch a mammoth independent enterprise, with headquarters in Muncie, Ind., with a number of branches and cut the rates for service. The system will be complete and underground. The long-distance connection will be made with his system at Indianapolis, reaching all of the cities of the State. Local business men advocate the movement and will purchase a portion of the stock. Petitions for a number of exchanges throughout the county will be presented soon. A rate war is anticipated as soon as the work on the new system begins.

The work upon the new telephone company's system in Memphis, Tenn., is progressing satisfactorily. James S. Warren, secretary of the new company, states that the success of the company was already assured. Subscribers are coming in at a satisfactory rate, and by October it is expected that the system will be in perfect running order. Already arrangements are being made for the extension of the system to all the principal towns within a radius of 150 miles of Memphis.

The Milwaukee, Wis., Electric Railway & Light Company will soon begin the work of replacing its entire telephone service, and also extending it to points not heretofore reached. General Manager John I. Beggs says that from \$30,000 to \$40,000 will be expended for the improvement. The system to be put in will be the Stromberg-Carlson system. It will reach to all points on the suburban and interurban lines, as well as to new points in the city where it may be found desirable.

The New York and Pennsylvania Telephone & Telegraph Company is making changes and improvements in Binghamton, N. Y.; the work is to cost about \$30,000. The installing of the new boards and batteries is under the direction of the company's engineer, B. C. Wolverton of Elmira, and Manager Sexsmith of Binghamton will superintend the outside work.

The new rural telephone line between Elcho and Enterprise Lake, Wis., the first to be established in Langlade County, is proving a great success and will probably be extended considerably this year. The line already connects five large farms and passes through a rich agricultural district that is being rapidly developed.

Farmers in the vicinity of La Fontaine, Ind., held a meeting recently to take steps for the organization of a telephone exchange. The proposition is to establish a central station at La Fontaine and connect the homes of farmers within a radius of five miles. It is practically assured that the system will be put in at once.

Several independent telephone companies have consolidated in Wisconsin, under the name of the Fox River Valley Telephone Company. It will be the strongest competitor of the Wisconsin Company, and one of the largest independent companies in the Northwest. The headquarters will be at Appleton.

The Fond du Lac, Wis., Street Railway Company, in which H. F. Whitcomb of Milwaukee is the heaviest stockholder, is to install a private telephone system to be used by the carmen in reporting any accident or happening on the lines. The system is to be the same as that in use in New York, and is the first to be installed in Wisconsin.

The Easton, Mich., Independent Telephone Company is building a telephone line through Easton and Orleans, Ionia County. W. A. Strong is manager.

The Mason County, W. Va., Telephone Company is extending its line from Point Pleasant to Mason City; also via Flat Rock to Jackson and Roane Counties.

The Citizens' Telephone Company of Grand Rapids, Mich., has increased its capital stock from \$550,000 to \$1,000,000. The company owns 29 outside exchanges and is preparing to build three more.

The Farmington Valley, Conn., Telephone Company has filed in the office of the Secretary of State a certificate of an increase in its capital stock from \$3,500 to \$7,000.

The People's Telephone Company of Knoxville, Tenn., intends to spend \$50,000 on improvements.

A telephone line is being built from Shrewsbury pond to Cuttingville, Vt.

Result of Telephone Rivalry.

According to a Baltimore, Md., paper, rivalry between the two telephone companies has brought about free telephone and messenger service temporarily at West Arlington. Pending the completion of the service in that section, which is expected to be in readiness by July 1, the Maryland Telephone Company has placed an instrument in the United Railways waiting room, which may be used free of charge. An attendant is there, in addition to a bicycle messenger boy, who will deliver telephonic messages free of cost between 9 A.M. and 6:30 P.M. within a radius of one half mile from the station. The company expects to have its Pikeville and Catonsville exchanges in operation by the end of the month, and the line to Belair, it is stated, is about completed.

The National Telephone Company of Wheeling, W. Va., now announces that it will have some telephones in working order by the middle of next month. Work on the switchboard is being prosecuted rapidly and it will soon be completed. The linemen are now running the wires into the exchange. The company claims to have 1,600 subscribers, with promise of several hundred more when the line is in complete operation. The Bell people in taking new contracts are agreeing to meet any cut that might be made.

An innovation in telephone service has been inaugurated by an Indianapolis, Ind., firm of grocers, who has signed a contract with the Central Union Telephone Company for fifty instruments, to be placed in the homes of customers. The telephones are to be used by the customers in placing orders for groceries, and this service is to be free of charge. But should they desire to make other calls, a fee of one cent is charged each time.

The Interstate Telephone Company is negotiating for the purchase of the Burlington County, N. J., telephone line, which extends to nearly all parts of that county. Representatives have been at Mount Holly during the past few days buying up the stock, and it is said that they now have enough to hold a controlling interest.

The Overton Telephone Company is putting in an exchange at Cookeville, Tenn. The company has a large force of men at work in Putnam and the adjoining counties putting up poles and wires and is fast completing its lines in that part of the State, and will soon have a large system in operation.

Mr. Sheerin sent out a personal letter to the managers of the Independent telephone companies in Indiana asking for the exact number of Independent and Central Union telephones in each county. He will make up a report from this and incorporate it in his annual report at the National meeting of the Independent companies at Buffalo.

W. J. Martin, superintendent of the contract department of the People's Telephone Company of Detroit, Mich., says that every farmer in Wayne County who wishes it will be connected with the People's Detroit exchange without any extra expense to the farmer.

The Kinloch Telephone Company at Alton, Mo., has received several carloads of poles, which will be placed in position within a few weeks. The company announces that it expects to have the Alton exchange in operation by October 1.

The Stock Telephone Company, which was organized in Bruce, Wis., some time ago, is receiving poles and distributing them along the Soo between Cameron and Prentice, with the intention of starting work at once.

The Northeastern Pennsylvania Telephone Company has completed its Ararat, Jackson and Gelatt line, except to string the wires, and the Thompson and New Milford line is under construction.

Harmony, O., township farmers have organized the Home Telephone Company, with \$10,000 capital, and the following officers: President, C. A. Snyder; secretary and manager, E. E. Hodge; treasurer, D. H. Campbell.

The New England Telephone Company has commenced work in North Easton, Mass., prior to the establishment of a local exchange.

The Mandan, N. D., and Northwestern Electrical Company has completed setting the poles and stringing the wires on its new telephone line from Mandan to Oliver County.

The Bell Telephone Company will soon put in new 'phones at Johns, Ala.

Kenton, Tenn., is soon to have three telephone exchanges.

Long Distance Telephone for New Mexico.

Abraham Kempenich, a general merchant of Peralta, N. M., is the original promoter of a long distance telephone line to connect Albuquerque with the principal river towns of Valencia County, and has subscribed toward the proposition. He was lately in consultation with the officers of the Mutual Automatic Telephone Company of Albuquerque and announced before his departure for Peralta that he has assurances that the line will be constructed in a few weeks. Besides himself, twelve other merchants, south of Albuquerque, are subscribers, and the towns to be connected are Isleta, Peralta, Belen, Los Lunas, Esmeralda, Tome and Valencia. Merchants of Albuquerque will also be petitioned to subscribe.

The charter of incorporation of the Mississippi Telephone Company is being published. The purpose for which this company is formed is to build and operate telegraphic lines between Meridian, Miss., and New Orleans, La.; between Jackson, Miss., and Mobile, Ala., and from Laurel in a northerly and in a southerly direction along the proposed line of the Kingston and Central Mississippi and Laurel and Waynesboro railroads.

The Mitchell-Grange telephone line has been completed between Mitchell and Grange, Ga. The stockholders of the line hope to have connection with Louisville shortly. From Louisville, the line will have connection with Augusta, Atlanta and other points.

At a meeting held in Silvertown, Tex., capital stock to the amount of \$1,200 was subscribed to build a telephone line from Silvertown to Estelline, on the Fort Worth & Denver City Railroad, a distance of 65 miles. The line will be rushed through and will soon be in operation.

Fire in the construction department of the New York & New Jersey Telephone Company's plant at No. 124 West 50th street on the morning of June 5 did \$10,000 damage.

The Owosso, Mich., common council has accepted the Bell Telephone Company's offer to put in 'phones in every city official's house free of charge.

The Kearsarge, N. H., Telephone Company has notified the Secretary of State of an increase of its capital stock to \$10,000.

A franchise has been granted to the American Telephone & Telegraph Company to establish a long-distance telephone system at Greenville, S. C.

The Cannon Valley Telephone Company is putting in the local telephone exchange at Elysian, Minn. This exchange will connect with the Greene & Western long-distance line.

The Peninsular Telephone Company has begun work on its proposed underground system in Tampa, Fla.

A telephone line is to be placed between Chesham and Breed Pond, N. H.

Melrose, Minn., will have a telephone system.

TELEPHONE INCORPORATIONS.

The High Grove Telephone Company, Bardstown, Ky.—to construct and operate telephones in Nelson County.

The Kiowa & Comanche Telephone Company, Comanche, Tex. Capital stock, \$5,000. Incorporators: F. T. Cook, J. A. Tuipiel and J. W. Malone of Cloud Chief.

The Hopkinton Telephone Company, Hopkinton, Ia. Capital stock, \$3,000. Officers: S. P. Carter, president; C. E. Reeve, vice-president; F. C. Reeve, secretary, and J. S. McConnell, treasurer.

The Home Telephone Company, Cook, Neb.—to establish, maintain and operate an independent telephone system in Cook, with long-distance connections with other independent systems in the southeastern section of the State. Capital stock, \$30,000. Incorporators: J. J. Brown, G. G. Betzelberger and H. F. Canon.

The Hudson and Middlesex Telephone & Telegraph Company, Trenton, N. J.—to begin operations at a point under the Hudson River, in the County of Hudson, at the easterly line of said county, where said lines will connect with lines of telegraph or telephone, or both, without the State of New Jersey, and continuing thence through the counties of Hudson, Essex, Union, Middlesex, Monmouth, Mercer, Ocean, Burlington and Camden, to a point under the Delaware River, at the westerly line of said County of Camden, where said line will connect with telegraph or telephone, or both, without the State of New Jersey. Capital stock, \$15,000. Incorporators: Bryan S. Klotz, Sylvester M. Cooley and Walter P. Lindsley.

GENERAL ELECTRICAL NEWS.

Lighting.

Alexandria, La.—A new power house will be erected for the city electric light and waterworks plant. I. W. Sylvester, city engineer.

Anderson, Ind.—An appropriation of \$25,000 has been recommended for improving the electric light plant and waterworks. Address Mayor Dunlap.

Bloomington, Wis.—This town is talking of electric lights, and it is proposed to organize a stock company for the purpose of building a plant.

Cape May, N. J.—The Cape May Electric Company has been granted the privilege of furnishing electric illumination for the streets for a period of five years at a cost of 35 cents per light per night.

Cartersville, Ga.—This city will vote June 22 on bonds for \$10,000 to build the proposed electric light plant. F. M. Ford, mayor.

Chattanooga, Tenn.—The electric light plant here is soon to be sold, and it is quite probable that the city authorities will bid it in.

Fullerton, Neb.—Two applications have been filed with the city council for an electric light franchise, one by T. Lee and another by E. D. Gould.

Grand Rapids, Mich.—The M. B. Wheeler Company of this city has secured a contract to install the municipal electric lighting plant of Reading, Mich.

Hancock, Md.—This place may be lighted by power from the electric plant of Berkeley Springs, Va., which is six miles away.

Holden, Mo.—McMillan & Simpson have been granted a franchise for an electric light and heating plant.

Ipswich, Mass.—Ipswich is to establish an electric lighting plant at a cost of \$25,000.

Le Roy, N. Y.—Justice Childs has appointed John H. Ward, of Batavia, receiver of the Le Roy Gas & Electric Company, which is in financial difficulties.

Little Rock, Ark.—W. H. Wissig of St. Louis, Mo., will purchase the municipal electric light plant.

Madison, Fla.—The Madison Power Company has been granted the privilege of establishing and operating an electric light plant.

Murdock, Minn.—The citizens have voted to issue bonds for the purpose of erecting an electric light plant.

Orlando, Fla.—This city will vote June 22 on the proposition of J. M. Cheney and associates for the erection of an electric light plant of twenty-eight 2,000 candle power arc lights. If the plant is installed the Orlando Water & Light Company will be organized to operate it.

Paris, Ill.—The city council has about concluded to put in a new electric light plant.

Philadelphia, Pa.—C. Taylor Leland, 142 Chestnut street, is ready for bids for installing an electric plant for the Delaware City Light & Water Company, including dynamos, wire and poles.

Portage La Prairie, Man.—The town council is considering the question of erecting a municipal electric light plant.

Roanoke, Ala.—This city has sold bonds and will commence work about June 15 on the proposed \$25,000 waterworks and \$10,000 electric light plant. Z. J. Wright, mayor.

St. Michael's, Md.—A company is being organized in St. Michael's with \$10,000 capital stock to erect an electric light plant. O. Hammond, Glenn Building, Baltimore, is interested.

Union, N. J.—In the near future a large electric light plant is to be erected here.

Wichita, Kan.—The Wichita Gas, Electric Light & Power Company has decided to spend \$20,000 in improvements on its plant, and new machinery will be installed.

Street Railways.

Amsterdam, N. Y.—The directors of the Fonda, Johnstown & Gloversville Railroad Company have voted to extend its electric road, connecting with Fonda, Johnstown and Gloversville, from Johnstown to this place. Work of survey will be commenced at

once.—The directors of the Amsterdam Street Railroad Company have voted to extend its line from here to Schenectady, connecting with the Schenectady Electric Road. A survey will be made at once.

Aurora, Ill.—The Elgin, Aurora & Southern Traction Company of this place was lately incorporated for \$2,000,000 to operate street railroads, tramways and light, heat and power plants. L. J. Wolff, F. B. Bicknel, H. Greenebaum and others are the promoters.

Birmingham, Ala.—The Metropolitan Rapid Transit Railway Light & Power Company will build an electric power plant. E. F. Enslin, treasurer.

Bryan, O.—A franchise has been granted to Messrs. Cummins & Ramsey of Hillsdale, Mich., by the village council to operate an electric line through the corporation of Bryan. The proposed line is to run from here through Pioneer to Hillsdale. The right-of-way for this line has nearly all been secured.

Dover, Pa.—Right-of-way has been secured for a trolley line from Mechanicsburg, Cumberland County, to this place in York County, where connections will be made with the York and Dover trolley line.

Houston, Tex.—H. Baldwin Rice was recently appointed receiver of the Houston Electric Street Railway Company, and his bond was fixed at \$50,000.

Key Port, N. J.—The residents of this place feel assured that the trolley between here and Matawan will be built, and that this will be only one link in the trolley chain that will connect the metropolis and the Monmouth shore.

New Albany, Ind.—The promoters of the New Albany and Paoli electric line declare that the line will be built. It will be 40 miles long and the track is to be laid on the New Albany and Paoli turnpike.

New York City.—The old West End Road to Coney Island, which has been undergoing reconstruction for some time, will soon be completed. Part of the road has already been operated, but cars were not run to Coney Island. The Coney Island end of the road will be finished within two or three weeks. The motive power on this road will be electricity, thus making the third electric elevated road in the Brooklyn Rapid Transit system.

Omaha, Neb.—Plans for consolidation of the street railways of this city and Council Bluffs, the electric power plants of the two cities, and the Platte River Canal appear to be assuming a definite shape, and it is said the consolidation now hinges only on terms of purchase. The new combination will probably be capitalized at \$20,000,000.

Ottawa, Ont.—A scheme is on foot to build an electric railway from Buckingham up the Lievre River to the L'Original Rapids, 100 miles above Buckingham. The falls along the route will be used to furnish the motive power.

Plainwell, Mich.—H. Patterson, manager of the Grand Rapids, Allegan & Kalamazoo Traction Company, says that the electric road through Plainwell is a sure thing, and that everything will be completed by January 1 next.

Sharon, Pa.—The Youngstown-Sharon Street Railway Company has awarded the contract for all the steel rails to be used in the construction of the line between this city and Newcastle, a distance of 21 miles. It is the intention to expend about \$2,500,000 in Western Pennsylvania and Ohio on its new trolley system. The road, when completed, will connect Sharon and Cleveland.

Taylorville, Ill.—An electric line will be built from here to Mount Auburn. It will be known as the David M. Sharp line. Mr. Sharp says that the right-of-way has been secured between the two places, and that the Cleveland Construction Company, which is now building an electric road from Philadelphia to New York, has offered to construct the Mount Auburn line and accept pay in stock.

Titusville, Pa.—It is understood that the consolidation of the Meadville, Cambridge Springs, Venango and Titusville street railway companies is but the initial step to form a combine of all the trolley lines in Western Pennsylvania, and of those in Eastern Ohio. It is said that the consolidated lines will have a

capital of over \$3,000,000. The combined length of the roads is over 200 miles.

Woodbury, Pa.—A deal was lately consummated, by which the Gloucester & Salem Turnpike Company was merged into a trolley company, and a line is to be built from here to Swedesboro, and also connect with the Paulsboro Traction Company's line at Clarksboro.

Company Matters.

Albany, N. Y.—Certificates filed last week announce the merger of the Coxsackie Electric Light Company and the Athens Electric Light & Power Company with the Upper Hudson Electric Company. The capital of each is \$20,000.

Burlington, Vt.—At the recent annual meeting of the Vermont Electric Company the following officers were chosen: President, A. E. Richardson; vice-president, Edward A. Pope; secretary and treasurer, A. C. Whiting; manager, Walter S. Vincent. There was a large attendance of stockholders and the affairs of the company were found to be in excellent condition.

Concord, N. H.—The Concord Electric Company, formed to take over the property and business of the Concord Land & Water Power Company, filed articles of agreement a short time ago. The capital stock of the company is \$400,000, and the incorporators are: W. H. Whitney, Chas. H. Stone of Boston, Fred. C. Demond, Allen Hollis and Geo. L. Osgood of Concord.

Reading, Pa.—The Reading Electrical Construction Company reports a very busy season in electrical work.

South Milwaukee, Wis.—The Chicago Bronze Electric & Foundry Company has decided to remove its plant from Chicago to this place.

Power and Transmission.

Redlands, Cal.—H. H. Sinclair, president and general manager of the California Electric Power Company, is soon to take an Eastern trip, and upon his return work will be commenced on developing electricity in the Kern River, where the company has extensive and valuable water rights. Plant No. 1 will cost not less than \$2,000,000, and when completed it will conduct to Los Angeles 16,000 horse power. A second plant will be erected on a site already selected as soon as the market demands may justify. The company intends to supply electricity to not only Los Angeles, but to companies operating in many adjacent towns. The new enterprise will not lack for financial backing.

Richmond, Va.—The New York Trust Company will build and equip a power plant to furnish power for the Richmond & Petersburg Railway Company and power and light for this city. The undertaking will represent a cost of \$1,000,000.

Winnipeg, Man.—The question of utilizing Park Lake as a water power to operate the municipal electric light and telephone system is now occupying the attention of the town councilors and mayor. If this body of water can be used for this purpose it will considerably relieve the expense of operation.

Automobiles.

Baltimore, Md.—The Snow Deal Manufacturing Company of this city, with a capital of \$100,000, will manufacture bicycles and automobiles.

Carlisle, Pa.—The Pennsylvania Electric Vehicle Company of this city, capitalized at \$2,500,000, has lately been incorporated.

Harrisburg, Pa.—The Penn Auto Company was recently organized with a capital stock of \$5,000.

Riverhead, N. Y.—There is a possibility of a company locating here whose specialty is the manufacture of automobiles and electric launches.

Springfield, Mass.—The Springfield Automobile Company is now located at 60 Main street.

Troy, N. Y.—The Hidley Automobile Company is located here with a capital of \$50,000. Eugene Bryan J. B. Holmes and N. R. Holmes, all of this city, are the directors.

Toledo, O.—The Toledo Automobile Company has changed its name to the Toledo Motor Carriage Company.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mtg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Authoriz'd	Issued.					Authoriz'd	Issued.				
Albany, N. Y.—June 8						Hartford Conn.—June 8					
United Traction.....	100	\$5,000,000	\$5,000,000	1 1/4 % Q.	106 108	Hartford Street Ry. Co.....	100	\$4,000,000	\$200,000	8 % S., Oct.,	150
(Consolidation of the Albany and Troy City Railway.)						Hartford & West Hartford.....	100	1,000,000	247,000		
Allentown Pa.—June 8						Holyoke Mass.—June 8					
Allentown & Lehigh Val. Trac Co.	100	4,000,000	1,500,000		15	Holyoke Street Ry. Co.....	100	400,000	400,000	8 % A., June,	207 1/2 212
Bridgeport, Conn.—June 8:						Hoboken N. J.—June					
Bridgeport Traction Co.....	100	2,000,000	2,000,000	1 % Aug.,	100	North Hudson Co. (N. J.) Ry. Co..	25	1,250,000	1,000,000	8 %	150
Baltimore Md.—June 8						Indianapolis, Ind.—June 8					
United Railways & Elec. Co.....	50	24,000,000	18,000,000		16 1/4 16 3/4	Indianapolis Street Ry.....	100	5,000,000	5,000,000		25 25 1/2
Boston, Mass.—June 8						Lancaster, Pa.—June 8					
New England Street Ry.....	25	5,000,000	1,081,925	1 % Q., Jan. 15,	15	Pennsylvania Traction Co.....	100	10,000,000	9,900,000		
North Shore Traction Co.....	100	4,000,000	4,000,000		85	Lancaster & Col. Electric Ry.....	100		\$7,500		
North Shore Traction Co..... pfd.	100	2,000,000	2,000,000	6 % S. A. & O.	85	West End Street Railway.....	100				
West End Street Ry. Co.....	50	10,000,000	8,480,000	8 % S. Oct.,	95 95 1/4	Louisville, Ky.—June 8					
West End Street Ry. Co..... pfd.	50	4,400,000	6,400,000	4 % S. Jan.,	114 115	Louisville Ry.....	100	4,000,000	8,500,000	1 1/4 % S., April,	82
Boston Elevated R. R.....	100	10,000,000		2 1/4 % Aug. 99,	179 181	Louisville Ry..... pfd	100	2,500,000	2,500,000	2 1/4 % S., Oct. 1,	112 118
Brooklyn N. Y.—June 8:						Minneapolis, Minn.—June 8					
Brooklyn City Ry.....	100	2,000,000	1,928,400		242 244	Twin City Rapid Transit.....	100	17,000,000	15,010,000		68 1/2 68 1/2
Brooklyn Rap. Transit Co., tr. cert.	100	48,000,000	48,000,000		80 80 1/4	Twin City Rapid Transit..... pfd	100	8,000,000	1,712,200	1 1/4 % Oct.,	186 187 1/2
Brooklyn Heights Railroad.....	100	200,000	200,000		107 109	Montreal, Canada.—June 8					
Brooklyn City RR.....	100	12,000,000	12,000,000	8 % Q., Jan.,	267 289	Montreal Street Ry. Co.....	50	4,000,000	4,000,000	8 % S. M. & N.	279
Brooklyn, Queens Co. & Sub. RR.	100	2,000,000	2,000,000		325 330	Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1 1/4 % S. J. & J.	280 110 1/2
Queens Island & Brooklyn RR.	100	2,000,000	1,884,200	2 1/4 % Nov.,		Memphis Tenn.—June 8					
Kings County Elevated.....	100	4,750,000	4,750,000			Memphis Street Railway Co.....	100	500,000	500,000		2 1/2
Kings County Traction Co.....	100	4,500,000	4,500,000	1 % July		New Haven, Conn.—June 8:					
Nassau Electric Railroad.....	100	6,000,000	6,000,000		82 88	Fair Haven & Westville R.R.....	25	2,000,000	2,000,000	8 % S., Sept.	89
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000			New Haven Street Railway Co.....	100	1,250,000	1,000,000	2 1/4 % A., July	41
Brooklyn, B. & W. E. Railroad.....	100	1,000,000	1,000,000			New Haven & Centerville.....	100	700,000	800,000		
Buffalo N. Y.—June 8:						Winchester Avenue RR.....	25	1,000,000	600,000		45 46
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000		74 75	New Orleans, La.—June 8					
Buffalo Railway Co.....	100	6,000,000	5,870,500	1 % Q. Dec.	99 100	Canal & Claiborne RR. Co.....	40	240,000	240,000	4 % S., July,	
Columbus O.—June 8						New Orleans & Carrollton RR.....	100	1,200,000	1,200,000	1 1/4 % Q., Oct.	148 1/2 150
Columbus Street Railroad.....	100	8,000,000	8,000,000	1 % Q., Feb.	40 40 1/2	New Orleans Traction Co new com.	100				22 1/2 24
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000		99 100	New Orleans Traction Co new pfd.	100				95 98
Charleston, S. C.—June 8						Orleans City RR.....	100	2,000,000	2,000,000	8 % S., Jan.,	20 1/2 26
Charleston City Ry. Co.....	50	100,000	100,000	8 % S.		New Or. City & Lake RR.....	100	2,000,000	2,000,000	4 % S., Jan.,	
Enterprise City RR. Co.....	25	1,000,000	250,000			Orleans Railroad.....	50	500,000	185,000	1 1/4 % S., June,	52
Chicago, Ill.—June 8						St. Charles Street Railway.....	50	1,000,000	1,000,000	1 1/4 % Oct.,	58 1/2 67
Chicago City Ry. Co.....	100	12,000,000	12,000,000	8 % Q., Dec. 31,	250 260	New York—June 8:					
Chicago & South Side R. T. RR.....	100	10,828,800	10,828,800		18 1/4 14	Central Crostown RR.....	100	600,000	600,000	2 1/4 % Q.	255 260
Lake Street Elevated RR.....	100	10,000,000	10,000,000		34 1/2 34 3/4	Christopher & 10th Sts. RR. guar.	100	650,000	650,000	2 1/4 % Q., Oct.,	175 185
Metropolitan West Side Elev. Ry....	100	15,000,000	7,000,000	Feb 28 1900.	88 88 1/4	Dry Dock, E. B. & W. & Battery RR.	100	1,200,000	1,200,000	1 1/4 % Q., Nov.	120 125
Met. West Side EL., pfd.....	100	15,000,000	9,000,000		209 210	Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000	2 1/4 % Q., Feb., 1901.	171 1/2 172
North Chicago Street RR.....	100	10,000,000	6,800,000	8 % Q., Jan.	197 200	Bleecker St. & Fulton St. Ry. guar.	100	900,000	900,000	4 % A., July, 1901.	85 87
North Chicago City RR.....	100	500,000	249,900		108 109	Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000	2 1/4 % Q.	286 240
South Chicago City Railway.....	100	2,000,000	1,608,200		104 104 1/2	Gen. Park N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2 1/4 % Q.	205 210
West Chicago St. RR. Co.....	100	20,000,000	18,189,000	1 1/4 % Q., Feb.	18 1/2 18 1/4	Eleventh Avenue RR.....	100	1,000,000	1,000,000		398 405
Union Traction Ry.....	100	1,250,000	624,900	8 % S.	59 59 1/2	42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	4 % Q.	392 402
Union Traction Co.....	100	2,000,000	2,000,000			Ninth Avenue RR.....	100	800,000	800,000		198 201
Cincinnati, Ohio.—June 8:						Sixth Avenue RR.....	100	2,000,000	2,000,000		285 205
Cincinnati Inc. Plane Ry.....	50	1,000,000	875,000			Twenty-third St. B. R. Co. guar.	100	600,000	600,000	4 % Q.	400 410
Cincinnati Inc. Plane Ry..... pfd.	50	150,000	150,000	1 % Feb.		Third Avenue RR.....	100	2,500,000	1,862,000	2 1/4 % Q., Jan.	210 212
Cincinnati, Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2 1/4 % Feb.	75 76	42d St. Manhattan & St. Nich. Av	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.	123 1/2 123 1/2
Cincinnati Street Ry. Co.....	100	18,000,000	14,000,000	1 1/4 % Q., Jan.	124 125	Union (Huckleberry) Ry.....	100	2,500,000	2,500,000		65 75
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1 1/4 % Q., Jan.	126 127	Newark N. J.—June 8					
Cleveland, Ohio.—June 8:						Consolidated Traction Co. of N. J..	100	15,000,000	15,000,000		70 1/2 70 1/2
Akron, Bed. & Cleve. Elec. Ry.....	100	1,000,000	1,000,000	3 % Jan.	48 50	North Jersey Railway Co.....	100	6,000,000	6,000,000		20 1/2 21 1/2
Cleveland City Ry.....	100	8,000,000	7,600,000	8-5 % Jan.	100 102	United Elec. Co. of New Jersey..	100	504,000	504,000	1 1/4 % A.	28 1/2 28 1/2
Cleveland Electric Ry.....	100	12,000,000	12,000,000	3 % Q., Oct.,	88 84 1/4	Pittsburg, Pa.—June 8					
Detroit, Mich.—June 8						Allegheny Traction Co.....	50	500,000			27 28
Detroit Citizens' Street Ry.....	100	2,000,000	1,250,000		100 100	Consolidated Traction Co.....	50	15,000,000			24 24 1/4
Wayne & Belle Isle Ry.....	100	1,200,000	1,200,000		175	Consolidated Traction Co..... pfd.	50	9,478,850			63 1/2 63
Rapid Railway Co.....	100	250,000	250,000		90 100	Central Traction Co.....	50	1,500,000			78 1/2 78 1/2
Detroit Electric Railway.....	100	1,000,000	1,000,000			Citizens' Traction Co.....	50	8,000,000			72 1/2 72 1/2
Wyandotte & Detroit River Ry.....	100	250,000	200,000			Duquesne Traction Co.....	50	8,000,000			
Dayton O.—June 8:						Pittsburg Traction Co.....	50	2,500,000			
City Railway Co.....	100	1,500,000	1,470,500	1 1/4 % Q.	140 145	Federal St. & Pleasant Valley Ry..	25	1,400,000			
City Railway Co..... pfd	10	600,000	600,000	1 1/4 % Q.	170	Pgh., Allegheny & Man. Trac. Co...	50	8,000,000			
People's Street Railway.....	100	1,100,000	1,100,000		114 115	Pittsburg & Birmingham Trac. Ry..	25	1,500,000			

* Unlisted. † Ex div.
 a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.
 b Leased to Boston Elevated Railroad Company.
 c Owned by Brooklyn Rapid Transit Company.
 d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
 e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
 f Stock owned by Kings County Traction Company; road leased to Nassau Electric R.R.
 g Owned by Atlantic Ave. R.R. and leased to Nassau Electric R.R.
 h \$30 per share on outstanding capital paid as rental by lessee—West Chicago St. R.R. Co.; \$200,000 of stock owned by North Chicago Street Railroad Company.
 i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
 j \$35 per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,000 of stock owned by West Chicago Street Railroad Company.
 k Majority of stock owned by Chicago West Division Railway Company; 8 % on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
 l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex-div.
 a Leased to New Orleans Traction Company at 6 % on stock.
 b Leased to New Orleans Traction Company at 8 % on stock.
 c Leased to Central Crostown Railroad at 8 % on stock and interest on bonds.
 d Operating the former Met. Trac. system, that corporation having become extinct.
 e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
 f Leased to Houston, West Street & Pavyonia Ferry—now Metropolitan Street Railway.
 g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
 h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1893, at \$215,000 per annum.
 i Leased to Met. St. Ry. for 99 years from April 20, 1892; 6 % first 5 years, 8 % thereafter.
 j Leased to Metropolitan Street Railway for \$145,000 per annum.
 k Leased to Metropolitan Street Railway for 18 % on capital stock.
 l Controlled by Third Avenue Railroad by purchase.
 m Dividends of 1 1/4 % yearly guaranteed by Consolidated Traction Company.
 n Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.
 o Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
 p Leased to Fort Pitt Traction Company for 6 % on \$5,000,000 capital stock.
 q Leased to Consolidated Traction Company for 4 % on capital stock.
 r Leased to Consolidated Traction Company for 7 % on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Capital Stock.			Rate and Date of Last Div.	Eld.	Asked.	NAME.	Capital Stock.			Rate and Date of Last Div.	Eld.	Asked.
	Par	Author'd	Issued.					Par	Author'd	Issued.			
New Bedford Mass.—June 8	100	\$850,000	\$850,000	2% Feb.	160	165	Boston, Mass.—June 8	100	50,000,000	28,650,000	4% Q. Jan.	173	173 1/4
Union Street Railway Co.	100	800,000	225,000	4% A., June.	179	178	American Tel. & Tel. Co.	100	10,894,800	10,804,800	1% Q. Feb. 20.	87	87 1/2
Northampton, Mass.—June 8	100	800,000	225,000	4% A., June.	179	178	Erie Telegraph & Telephone Co.	100	10,894,800	10,804,800	\$1.50 p. sh. Feb.	142	143
Northampton Street Ry.	100	800,000	225,000	4% A., June.	179	178	New England Telephone Co.	100	10,894,800	10,804,800	\$1.50 p. sh. Feb.	142	143
Omaha, Neb.—June 8	100	5,000,000	5,000,000	8% A. and N.	55	55	New York.—June 8	100	14,000,000	14,000,000	1% Q.	91	94
Omaha Street Ry.	100	5,000,000	5,000,000	8% A. and N.	55	55	American Telegraph & Cable Co.	100	6,500,000	6,500,000	1% Q.	100	105
Paterson, N. J.—June 8	100	1,250,000	1,250,000	—	54	—	*Central & South Am. Tel. Co.	100	10,000,000	10,000,000	1% Q.	178	175
Paterson Ry. Co.	100	1,250,000	1,250,000	—	54	—	*Commercial Cable Co.	100	1,000,000	1,000,000	1% Q.	42	50
Providence, R. I.—June 8	100	8,000,000	8,000,000	3% Oct.	110	111	Franklin Tel. Co.—2% guar.	100	5,000,000	4,800,000	1% Q. Feb.	116	118
United Traction & Electric Co.	100	8,000,000	8,000,000	3% Oct.	110	111	Erie Telegraph & Telephone Co.	100	5,000,000	4,800,000	1% Q.	116	118
Philadelphia.—June 8	50	2,000,000	1,770,000	2% Dec.	28	24	*Gold & Stock Tel. Co.—guar. 6%	100	5,000,000	4,800,000	1% Q.	116	118
Fairmount Park Trans. Co.—\$50 pd.	50	1,966,100	1,966,100	2% July 15.	47	48	*International Ocean Tel. Co.—guar. 6%	100	5,000,000	4,800,000	1% Q.	116	118
Restonville, Man. & Fairmount.	50	582,900	582,900	8% S. July.	75	76	Mexican Telephone Co.	100	2,000,000	2,000,000	2% Q. Jan.	163	168
Restonville, Man. & Fairmount.	50	582,900	582,900	8% S. July.	75	76	*New York & New Jersey Tel. Co.	100	5,000,000	5,000,000	2% Q. Jan.	163	168
aFairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	8% Feb. 1.	27 1/2	30 1/2	*Pacific & Atlantic Tel. Co.—guar. 4%	25	2,000,000	2,000,000	2% Q. Jan.	70	75
Union Traction Co.—\$12 1/2 pd.	50	80,000,000	29,380,450	—	—	—	*Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1% Q.	95	100
Electric Traction Co.	50	500,000	192,500	8% share Q.	345	—	*Sout'n & Atlantic Tel. Co.—guar. 5%	25	950,000	559,525	2% S. Jan.	118	120
dCitizens' Passenger Ry.	50	500,000	192,500	8% share Q.	345	—	*Commercial Union Telegraph Co.	25	500,000	500,000	1% Q. Jan.	94	94 1/4
eFrankford & Southwark Pas. R.	50	1,000,000	1,875,000	\$14 share A.—Apr.	400	451	Western Union Telegraph Co.	25	500,000	500,000	1% Q. Jan.	94	94 1/4
fLehigh Avenue Ry. Co.	25	1,000,000	1,000,000	A. & O.	90	90 1/2	*Div. guar. by Postal Tel. Co.	25	500,000	500,000	1% Q. Jan.	94	94 1/4
gLombard & South Street Ry.	50	1,000,000	1,000,000	8% share A. Mar.	800	—	Miscellaneous.—June 8	25	400,000	—	1% Q.	26	27
hSecond & Third Streets Ry.	50	1,000,000	1,000,000	8% share A. Mar.	800	—	American Dist. Tel. (Phila.)	100	8,960,000	8,564,000	2% S.	188	—
iPeople's Traction Co.	50	1,500,000	572,800	8% share—	151	151	Bell Teleph. Co. (of Canada.)	100	8,960,000	8,564,000	2% S.	188	—
jGermantown Passenger Ry.	50	1,500,000	572,800	8% share—	151	151	Chesapeake & Potomac Tel. Co.	100	8,960,000	8,564,000	2% S.	188	—
kGreen & Coates Passenger Ry.	50	1,500,000	572,800	8% share—	151	151	Chicago Telephone Co.	100	8,960,000	8,564,000	2% S.	188	—
lPeople's Passenger Ry.—com.	25	1,500,000	572,800	8% share—	151	151	Central Dist. Frig. & Tel. Co. (Pgh.)	100	8,960,000	8,564,000	2% S.	188	—
mPeople's Passenger Ry.—pfd.	25	1,500,000	572,800	8% share—	151	151	Empire & Bay States Telegraph Co.	100	8,960,000	8,564,000	2% S.	188	—
nPhiladelphia Traction Co.	50	30,000,000	120,000,000	\$2 p. sh. Oct.	92	92 1/4	Hudson River Telephone Co.	109	2,000,000	2,000,000	1% Q.	120	125
oCatherine & Bainbridge St.	50	1,000,000	1,000,000	6% A.—Mar.	158	157	*Northwestern Telegraph Co.—guar.	50	2,500,000	2,500,000	2% S. Q.	122	125
pContinental Pass. Ry.—guar.	50	1,000,000	1,000,000	6% A.—Mar.	158	157	Providence (R. I.) Tel. Co.	50	8,000,000	8,000,000	2% S. Q.	96	99
qEmpire Passenger Ry. Co.	50	1,000,000	1,000,000	6% A.—Mar.	158	157	Southern New Eng. Tel. Co.	100	8,000,000	8,000,000	2% S. Q.	96	99
rPhiladelphia City Pass. Ry.	50	1,000,000	1,000,000	6% A.—Mar.	158	157							
sPhiladelphia & Gray's Fy. RR.	50	1,000,000	1,000,000	6% A.—Mar.	158	157							
tRidge Avenue Passenger Ry.	50	1,000,000	1,000,000	6% A.—Mar.	158	157							
uPhiladelphia & Dart, Ry. guar.	50	1,000,000	1,000,000	6% A.—Mar.	158	157							
v17th & 19th Sts. Pass. Ry. guar.	50	1,000,000	1,000,000	6% A.—Mar.	158	157							
wThirteenth & 15th Sts. Pass. Ry.	50	1,000,000	1,000,000	6% A.—Mar.	158	157							
xUnion Passenger Ry. Co.	50	1,000,000	1,000,000	6% A.—Mar.	158	157							
yWest Philadelphia Pass. Ry.	50	1,000,000	1,000,000	6% A.—Mar.	158	157							
Rochester, N. Y.—June 8	100	5,000,000	5,000,000	—	29	31							
Rochester Railway Co.	100	5,000,000	5,000,000	—	29	31							
Reading, Pa.—June 8	100	1,000,000	1,000,000	Semi-an. Jan. & Jy.	24	26							
Reading Traction Co.	100	1,000,000	1,000,000	Semi-an. Jan. & Jy.	24	26							
City Passenger Ry.	50	850,000	850,000	Jan., '98.	70	—							
East Reading Electric Ry.	50	1,000,000	1,000,000	Jan., '98.	70	—							
St. Louis Mo.—June 8	100	800,000	150,000	—	—	—							
Fourth Street & Arsenal Ry.	50	400,000	400,000	—	—	—							
Jefferson Avenue Ry. Co.	50	2,500,000	2,400,000	—	—	—							
Lindell Ry.	100	2,500,000	2,400,000	—	—	—							
National Railway Co.	100	2,500,000	2,400,000	—	—	—							
Cass Avenue & Fair Grounds.	100	2,500,000	2,400,000	—	—	—							
Citizens' RR.	100	2,000,000	1,500,000	—	—	—							
St. Louis RR.	100	2,000,000	1,500,000	—	—	—							
Missouri RR.	50	2,400,000	2,800,000	—	—	—							
People's RR. Co.	50	1,000,000	800,000	—	—	—							
United Electric Ry.	50	1,000,000	800,000	—	—	—							
United Electric Ry. 5% pref.	100	1,000,000	1,000,000	—	—	—							
St. Louis & Suburban Ry.	100	800,000	2,500,000	—	—	—							
Union Depot RR.	100	4,000,000	4,000,000	—	—	—							
San Francisco, Cal.—June 8	100	1,000,000	600,000	50c. monthly.	117	119							
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119							
Geary Street Park & Ocean RR.	100	1,000,000	600,000	50c. monthly.	117	119							
Market Street Ry.	100	18,750,000	18,750,000	60c. per share.	61 1/2	68 1/2							
Presidio & Ferries RR.	100	1,000,000	550,000	60c. per share.	16	—							
Scranton Pa.—June 8	50	6,000,000	2,500,000	—	29	30							
Scranton Railway Co.	50	6,000,000	2,500,000	—	29	30							
Scranton & Carbondale Trac. Co.	100	500,000	500,000	—	16 1/2	—							
Scranton & Pittston Traction Co.	100	1,050,000	1,050,000	—	16 1/2	—							
Springfield Ill.—June 8	100	750,000	750,000	—	—	—							
Springfield Consolidated Ry.	100	750,000	750,000	—	—	—							
Springfield O.—June 8	100	1,000,000	1,000,000	—	—	—							
Springfield Street Ry.	100	1,000,000	1,000,000	—	—	—							
Springfield, Mass.—June 8	100	1,200,000	1,166,700	8% A.	207	212							
Springfield Street Ry.	100	1,200,000	1,166,700	8% A.	207	212							
Toronto Canada.—June 8	100	6,000,000	6,000,000	1% Q. S.	109 1/2	110 1/2							
Toronto Street Ry.	100	6,000,000	6,000,000	1% Q. S.	109 1/2	110 1/2							
Montreal Street Railway Co.	100	4,000,000	4,000,000	4% S.	279	280							
Washington, D. C.—June 8	50	500,000	500,000	—	—	—							
Belt Ry. Co.	50	500,000	500,000	—	—	—							
Capital Traction Co.	100	12,000,000	12,000,000	65c. per sh. Oct.	102 1/2	102 1/2							
Columbia Ry. Co.	50	400,000	400,000	6% A.	85	40							
Edgington & Soldiers' Home Ry.	50	707,000	652,000	—	20	21							
Georgetown & Tenallytown Ry.	50	200,000	200,000	—	20	21							
Metropolitan RR. Co.	50	1,000,000	458,900	2% Q.	—	—							
Worcester, Mass.—June 8	100	8,000,000	8,000,000	—	82 1/4	35							
Worcester Traction Co.—com.	100	8,000,000	8,000,000	—	82 1/4	35							
Worcester Traction Co.—6% pfd.	100	2,000,000	2,000,000	—	107	108							
Worcester & Suburban Street Ry.	100	550,000	542,500	4% Q.	—	85							
Wilkesbarre, Pa.—June 8	100	5,000,000	5,000,000	1% Jan.	25	26							
Wilkesbarre & Wyoming Val Trac.	100	5,000,000	5,000,000	1% Jan.	25	26							

* Unlisted. † Paid in. ‡ Full paid. § Outstanding. ¶ Ex-div.
 a Leased to Hestonville, Man. & Fairmount Passenger Ry. for 6% on stock per annum.
 b Consolidation Electric, People's and Philadelphia Traction companies. Fixed charges and all indebtedness of constituent and leased companies assumed by Union Traction Company.
 c Practically all shares owned by Union Traction Company.
 d Lease to Frankford & Southwark Passenger Ry. assumed by Electric Traction Co.
 e Leased to Electric Traction Company.
 f Controlled by Frankford & Southwark Passenger Railway.
 g Leased to People's Passenger Railway at \$5 per share.
 h Majority of stock owned by People's Traction Company.
 i Leased to Union Traction Company.
 j Lease transferred to Union Traction Company.
 k Leased to Union Traction Company at a rental of \$10,000 per annum in 1896-7-8, and \$20,000 in 1899-1900 and \$30,000 per annum thereafter, payable semi-annually, rental declared as a dividend semi-annually.
 l Dividend of 10% guaranteed by Reading Traction Company.
 m Dividend of 6% guaranteed by Reading Traction Company.
 n Leased and operated by the Scranton Railway Co., formerly Scranton Traction Co.

Boston, Mass.—June 8						
American Tel. & Tel. Co.....	100	50,000,000	28,650,000	4% X Q., Jan.	173	173 1/4
Erie Telegraph & Telephone Co.....	100	10,894,800	10,804,800	1 X Q., Feb. 20,	87	87 1/2
New England Telephone Co.....	--	10,894,800	10,804,800	\$1.50 p. sh. Feb	142	143
New York.—June 8						
American Telegraph & Cable Co...	100	14,000,000	14,000,000	1 1/2 X Q	91	94
*Central & South Am. Teleg. Co....	100	6,500,000	6,500,000	1 1/2 X Q.	100	105
*Commercial Cable Co.....	100	10,000,000	10,000,000	1 1/2 X Q.	178	175
Franklin Teleg. Co.....2% guar.	100	1,000,000	.....	1 1/2 X S.	42	50
Erie Telegraph & Telephone Co....	100	5,000,000	4,800,000	1 1/2 X Q., Feb.,	..	..
*Gold & Stock Telg. Co.guar. 6 %	100	5,000,000	.....	1 1/2 X Q.	114	118
*International Ocean Tel Co.guar 6%	100	8,000,000	.....	1 1/2 X Q.	116	118
Mexican Telephone Co.....	100	2,000,000	.....	..	3	8 1/2
*New York & New Jersey Tel. Co..	100	5,000,000	3,722,000	2 1/2 X Q., Jan.,	163	168
*Pacific & Atlantic Teleg. guar. 4 %	25	2,000,000	.....	2 X S.	70	75
*Postal Telegraph Cable Co.....	100	15,000,000	15,000,000	1 X Q.	..	..
*Sou't'n & Atlantic Telg. Co.guar.5 %	25	950,000	559,525	2 1/2 X S.	95	100
†Commercial Union Telegraph Co..	25	500,000	500,000	8 X S., Jan.,	115	..
Western Union Telegraph Co.....	--	.....	97,870,000	1 1/2 X Q., Jan.	94	94 1/2
†Div. guar. by Postal Teleg. Co.						
Miscellaneous.—June 8:						
American Dist. Teleg. (Phila.).....	25	400,000	.....	1 X Q.	26	27
Bell Teleph. Co. (of Canada.).....	100	3,960,000	3,564,000	2 X S.	188	..
Chesapeake & Potomac Teleg. Co..	100	.....	.....	.....	67	70
Chicago Telephone Co.....	100	.....	.....	.....	200	210
Central Dist Prtg & Telg.Co.(Pgh.)	100	750,000	750,000	.....	148	150
Empire & Bay States Telegraph Co.	...	.....	.....	.....	75	76
Hudson River Telephone Co.....	109	2,000,000	2,000,000	1 X Q.	130	125
*Northwestern Telegraph Co.guar	50	2,500,000	2,500,000	2 1/2 X Q.	122	125
Providence (R. I.) Teleph. Co.....	50	.....	.....	.....	56	99
Southern New Eng. Teleph. Co....	100	8,000,000	.....	.....	..	..

BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

PASSENGER RAILWAY.																			
NAME.		Amount.		Due	Interest periods.	Bid.	Asked.	NAME.		Amount.									
Authorized.	Issued.	Authorized.	Issued.					Authorized.	Issued.										
Albany N. Y.								New Orleans La.											
Date of Quotation—June 8, 1901								Date of Quotation—June 8, 1901											
The Albany Ry. Co.....Cons. mtg. 5s	\$500,000	427,500	1940	J. & J.	117½	.....	.....	Canal & Flatbush RR... cons mtg. 5s	\$150,000	\$150,000	1915	M. & N	.....						
The Albany Ry. Co.....Gen. mtg. 5s	750,000	875,000	1947	M. & N.	118½	.....	.....	Orescent City RR.....1st mtg. 6s	.....	50,000	1899	M. & N	105½						
Watervliet Turnpike & RR. 1st mtg. 6s	850,000	850,000	1919	M. & N.	125	.....	.....	Orescent City RR.....Cons. mtg. g. 5s	5,000,000	4,000,000	1945	J. & J.	.....						
Watervliet Turnpike & RR. 2d mtg. 6s	150,000	150,000	1919	M. & N.	124½	127	.....	New Orleans City RR.....1st mtg. 6s	416,500	899,000	1902	J. & D.	108						
Troy City Railway Co.....1st 5s	.....	.....	1942	.....	116	117	.....	N. Orleans City & Lake RR. 1st mtg. g. 5s	5,000,000	3,899,000	1902	J. & J.	112						
Interest guar. by Albany Ry. Co. Principal and interest guar. by Albany Ry. Co.								Orleans Railroad Co.....Cons. mtg. 6s				850,000	880,000	1907	F. & A.	.....			
								184 Charles St. RR. Co.....1st mtg. 6s				800,000	800,000	1915	J. & J.	.....			
								\$1428,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds				.....	75,000	90	J. & D.	.....			
								\$200,000 outstanding.				.....	.....	.....	.....	.....			
Baltimore Md.								New York.											
Date of Quotation—June 8, 1901								Date of Quotation—June 8, 1901.											
United Electric Ry. Co.....1st mtg. g. 4s	88,000,000	18,000,000	1949	M. & S.	102	102½	.....	Atlantic Ave. (Brooklyn).....Imp. g. 5s	1,500,000	1,500,000	1904	J. & J.	98	.....					
.....Income 4s	14,000,000	.....	1949	J. & D.	74½	75	.....	Atlantic Av. (Brooklyn) 1st gen. mtg. 5s	759,000	759,000	1909	M. & S.	107½	110					
Baltimore City Pass. Ry. 1st mtg. g. 5s	2,000,000	2,000,000	1911	M. & N.	118½	.....	.....	Atlantic Av. (Brooklyn) Cons. mtg. 5s	8,000,000	1,966,000	1901	A. & O.	116	.....					
Baltimore Traction Co.....1st mtg. 5s	1,500,000	1,500,000	1929	M. & N.	119	120	.....	Brooklyn & 7th Ave. 1st cons. mtg. g. 5s	12,500,000	7,650,000	1901	J. & D.	128	126					
Baltimore Traction Co. Exten. & Imp. g. 5s	1,250,000	1,250,000	1901	M. & S.	104½	.....	.....	Brooklyn & 7th Ave. 2d mtg. 5s	1,500,000	1,500,000	1904	J. & D.	104	104					
Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & J.	121	121½	.....	Broadway & 7th Ave. 2d mtg. 5s	500,000	500,000	1914	J. & J.	108	110					
Bal. Trac. Co. Coll. Trust 1st mtg. g. 5s	750,000	.....	1900	J. & J.	101	.....	.....	Broadway Surface.....1st mtg. 5s	1,125,000	1,125,000	1924	.....	115	111					
Baltimore Traction Co. Convertible 5s	800,000	.....	1906	N. & M.	102½	.....	.....	Broadway Surface.....2d mtg. 5s	1,000,000	1,000,000	1905	.....	106	106					
Central Pass. Ry. Co.....1st mtg. 6s	96,000	117,000	1912	J. & J.	.....	.....	.....	Brooklyn City RR. Co. 1st cons. mtg. 5s	6,000,000	6,000,000	1941	J. & J.	116	117					
Central Pass. Ry. Co. Cons. mtg. g. 5s	604,000	580,000	1932	M. & N.	119	121	.....	Brooklyn City & Newtown 1st mtg. 5s	2,000,000	2,000,000	1909	J. & J.	116	116					
City & Suburban Ry. 1st mtg. g. 5s	8,000,000	8,000,000	1922	J. & D.	116	117	.....	Brooklyn Bath & W. E. RR. Gen. mtg. 5s	1,000,000	448,000	1903	J. & J.	101	.....					
Lake Roland Elev. 1st mtg. 5s	1,000,000	1,000,000	1942	M. & S.	117	.....	.....	Brooklyn Heights RR.....1st mtg. 5s	250,000	250,000	1941	A. & O.	104	.....					
All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.								Brooklyn, Q's Co. & Sub'n. 1st mtg. 5s				8,500,000	8,500,000	1941	J. & J.	112	.....		
								Brooklyn, Q's Co. & Sub'n. 1st cons. 5s				4,500,000	2,750,000	1941	M. & N.	107	.....		
								Brooklyn Rapid Transit.....1st mtg. 5s				7,000,000	5,181,000	1945	.....	100½	.....		
								Bleecker St. & Fulton Ferry RR. 1st mtg. 7s				700,000	700,000	1900	.....	98½	100½		
								Cent Pk. N. & E. R. RR. 1st cons. mtg. 4s				1,200,000	1,200,000	1902	J. & D.	107	109		
								Central Croton RR.....1st mtg. 6s				250,000	250,000	1922	M. & N.	125	.....		
								Coney Island & Brooklyn RR. 1st mtg. 6s				800,000	800,000	1908	J. & J.	101	108		
								D. Dock, E. Bd'y & Ratt'y R. gen. mtg. g. 5s				1,000,000	980,000	1902	J. & D.	117	120		
								Dry Dock, E. Bd'y & Ratt'y R. scrip 5 ½				100,000	1,100,000	1914	F. & A.	102	105		
								Eight Ave. RR. Co.....Cert. indebt. 6 ½				000,000	1,000,000	1914	F. & A.	108	.....		
								42d St., Man. & St. Nich. Av. 1st mtg. 6s				200,000	1,200,000	1910	M. & S.	116½	117		
								42d St., Man. & St. N. Av. 2d mtg. inc. 6s				1,500,000	1,500,000	1915	J. & J.	124	125		
								Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s				5,000,000	5,000,000	1908	M. & S.	124	125		
								Metropolitan St Ry Co. g. m. cl. tr. g. 5s				12,500,000	12,500,000	1907	F. & A.	120	121		
								Second Avenue Ry. Gen. cons. mtg. 5s				1,600,000	1,600,000	1909	M. & N.	120	121		
								Second Avenue Ry. 1st mtg. 5s				800,000	800,000	1909	J. & J.	118½	109		
								Steinway Ry. (L. I.).....1st mtg. g. 5s				1,500,000	1,500,000	1922	J. & J.	116	117		
								South Ferry RR. Co.....1st mtg. 5s				850,000	850,000	1919	.....	110½	112½		
								Third Avenue RR.....1st mtg. 5s				5,000,000	5,000,000	1907	J. & J.	116	117		
								Twenty-third Street Ry.....1st mtg. 6s				.....	.....	1909	J. & J.	106	108		
								Twenty-third Street Ry.....Deb. 6s				150,000	150,000	1906	J. & J.	106	108		
								Union (Huckleberry) Ry.....1st mtg. 5s				2,000,000	2,000,000	1942	F. & A.	118	116		
								Westchester Electric RR.....1st mtg. 5s				500,000	500,000	1948	J. & J.	110	114		
								\$1,085,000 in escrow to retire gen. mtg. bonds.				.....	.....	.....	.....	.....	.....		
								\$184,850,000 in escrow to retire maturing obligations.				.....	.....	.....	.....	.....	.....		
								\$552,000 in escrow to retire 1st and 2d mtg. bonds.				.....	.....	.....	.....	.....	.....		
								2 In treasury. \$80,000.				.....	.....	.....	.....	.....	.....		
								2 Guar. by Union Ry. Co.				.....	.....	.....	.....	.....	.....		
								Toronto Canada.											
								Date of Quotation—June 8, 1901											
								Montreal St. Ry.....1st mtg. 5s				2,500,000	800,000	1908	M. & S.	.....	.....		
								Toronto St. Ry.....1st mtg. g. 4½s				4,550,000	1,200,000	1921	M. & S.	.....	.....		
								\$35,000 per m. single track authorized				.....	.....	.....	.....	.....	.....		
								\$600,000 in escrow to retire 6s due in 1901				.....	.....	.....	.....	.....	.....		
								Philadelphia.											
								Date of Quotation—June 8 19											
								Continental Pass. Ry.....1st mtg. 6s				850,000	810,000	1909	J. & J.	.....	.....		
								Empire Pass. Ry.....1st mtg. 7s				800,000	700,000	1900	J. & J.	.....	.....		
								Greene & Coates St. Ry.....1st mtg. 6s				100,000	100,000	1898	J. & J.	.....	.....		
								Lombard & So. St. Pass. Ry.....1st mtg. 6s				150,000	.....	1901	.....	.....	.....		
								People's Pass. Ry.....1st mtg. 6s				250,000	250,000	1905	J. & J.	.....	.....		
								People's Pass. Ry.....2d mtg. 7s				500,000	458,000	1911	J. & J.	.....	.....		
								People's Pass. Ry.....Cons. mtg. 5s				1,125,000	807,000	1912	M. & S.	.....	.....		
								People's Pass. Ry.....Stk. trs. cert. g. 4s				5,688,210	.....	1948	.....	.....	.....		
								Phila. City Passenger Ry.....1st mtg. 5s				200,000	200,000	1910	J. & J.	.....	.....		
								Philadelphia Trac. Co.....Coll. tr. g. 4s				1,800,000	1,018,000	1917	F. & A.	.....	.....		
								Thirteenth & 15th St. Ry.....1st mtg. 7s				100,000	100,000	1908	A. & O.	.....	.....		
								Union Passenger Ry.....1st mtg. 5s				500,000	500,000	1911	A. & O.	.....	.....		
								Union Traction Co.....1st mtg. 5s				29,785,000	29,724,876	1945	A. & O.	.....	.....		
								West End Passenger Ry.....1st mtg. 7s				.....	.....	1905	.....	.....	.....		
								West Phila. Pass. Ry.....1st g. 6s				250,000	246,000	1906	A. & O.	.....	.....		
								West Phila. Pass. Ry.....2d mtg. 5s				750,000	750,000	1926	M. & N.	.....	.....		
								The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.											
								Pittsburg Pa.											
								Date of Quotation—June 8 1901											
								Birmingham, Knox & Allentown.....5s				500,000	500,000	1981	M. & S.	111½	.....		
								Central Traction Co.....1st mtg. 5s				875,000	875,000	1900	J. & J.	.....	.....		
								Citizens' Traction Co.....1st mtg. 5s				1,250,000	1,250,000	1927	A. & O.	.....	.....		
								*Duquesne Traction Co.....1st mtg. 5s				1,500,000	1,500,000	1980	J. & J.	.....	.....		
								*Fed'l St. & Pleas. Val. Jack's Run.....5s				50,000	50,000	1918	J. & J.	.....	.....		
								Fed'l St. & Pleasant Valley.....Cons. 5s				1,250,000	1,250,000	1942	J. & J.	.....	.....		
								Millvale, Etna & Sharpsburg.....5s				750,000	750,000	1928	M. & N.	110	118		
								Pittsburg, Crafon & Mansfield.....5s				250,000	250,000	1924	J. & J.	.....	.....		
								Pittsburg Traction Co.....1st mtg. 5s				750,000	750,000	1927	A. & O.	.....	.....		
								Pittsburg & Birmingham.....1st mtg. 5s				1,500,000	1,500,000	1929	M. & N.	112	118		
								Pittsburg & West End.....1st mtg. 5s				500,000	500,000	1922	J. & J.	.....	.....		
								P'g'h. Allegh. & Manch. Gen. mtg. 5s				1,800,000	1,400,000	1980	A. & O.	.....	.....		
								Second Ave. Traction Co.....1st mtg. 5s				2,500,000	2,023,000	1984	J. & D.	.....	.....		
								Sub. Rapid Transit Railway Co.....5s				500,000	.....	1918	V. & S.	.....	.....		
								Providence R. I.											
								Date of Quotation—June 8 1901											
								Newport Street Ry.....Coupon 5s				50,000	50,000	1910	J. & D.	.....	.....		
								United Trac. & Elec. Co.....1st mtg. g. 5s				9,000,000	8,260,000	1928	M. & S.	116	118		
								St. Louis.											
								Date of Quotation—June 8, 1901.											
								Baden & St. Louis RR.....1st mtg. 5s				250,000	250,000	1918	J. & J.	101½	102½		
								Oass Ave. & Fair Gds Ry.....1st mtg. 5s				1,818,000	1,818,000	1912	J. & J.	101½	102½		
								Citizens' Railway Co.....1st mtg. 5s				2,000,000	1,800,000	1907	J. & J.	109	.....		
								Comp. Hts. Un. De. & Mer. Ter. ls				1,000,000	900,000	191	J. & J.	109	.....		

PASSENGER RAILWAY.

NAME.	Amount.		Date	Interest period.	Bid.	Asked
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—June 8/1901						
Jefferson Avenue Ry.....1st mtg. 5a.	270,000	270,000	1908	M. & N.	102	103
Lindell Ry. Co.....1st mtg. 5a.	1,500,000	1,500,000	1911	F. & A.	107	108
Missouri R.R. Co.....	1,000,000	700,000	1916	M. & N.	106	106
Mount City R.R. Co.....1st mtg. 5a.	400,000	300,000	1910	A. & O.	104½	105½
People's R.R. Co.....1st mtg. 5a.	125,000	125,000	1902	J. & D.	.....	.....
People's R.R. Co.....2d mtg. 7a.	75,000	75,000	1902	M. & N.	.....	.....
People's R.R. Co.....Cons. mtg. 5a.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric 1st mtg. 5a.	75,000	75,000	1905	J. & J.	100	101
St. Louis R.R. Co.....1st mtg. 5a.	2,000,000	2,000,000	1900	M. & N.	99½	100½
St. Louis & Sub. Ry.....1st mtg. g. 5a.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 5a.	300,000	300,000	.....	.....	80	84
Southern Electric Ry.....Cons. mtg. 5a.	500,000	500,000	1909	M. & N.	106	108
Taylor Avenue St. Ry.....1st mtg. g. 5a.	500,000	500,000	1912	J. & J.	116½	117½
Union Depot R.R. Co.....1st cons. mtg. 5a.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot R.R. Co.....Cons. mtg. 5a.	8,500,000	1,707,000	1918	J. & J.	121	122
Controlled by St. Louis R.R. Co.						
Controlled by Union Depot R.R. Co.						
Controlled by Lindell R.R. Co.						
(\$200,000 in escrow to retire 1st & 2d mtg.)						
(\$500,000 in escrow.)						
(\$200,000 in escrow to retire 1st mtg. 5a.)						
San Francisco Cal.						
Date of Quotation—June 8/1901.						
California St. Cable R.R.....1st mtg. g. 5a.	1,000,000	900,000	1915	J. & J.	114	117
Ferris & Cliff House Ry.....1st mtg. 5a.	650,000	650,000	1914	M. & N.	.....	117
Geary St. Park & Ocean R.R. 1st mtg. 5a.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. g. 5a.	2,000,000	2,000,000	1918	J. & J.	120½	.....
Metropolitan Ry. Co.....1st mtg. 5a.	200,000	.....	.....	.....	.....	.....
Omnibus Cable Co.....1st mtg. 5a.	2,000,000	2,000,000	1918	A. & O.	120½	.....
Park & Cliff House R.R.....1st mtg. 5a.	350,000	350,000	1912	J. & J.	105½	107
Park & Ocean R.R.....1st mtg. 5a.	250,000	250,000	1914	J. & J.	115	.....
Powell St. Ry.....1st mtg. 5a.	700,000	700,000	1912	M. & N.	.....	125
Utter St. Ry. Co.....1st mtg. g. 5a.	1,000,000	900,000	1918	M. & N.	.....	.....
Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—June 8, 1901						
Belt Ry. Co.....Cons. mtg. 5a.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 5a.	500,000	500,000	1914	A. & O.	109	.....
Washington & Soldiers' Home 1st mtg. 5a.	300,000	300,000	1911	J. & D.	.....	.....
Metropolitan R.R. Co.....Coll. tr. cons. 5a.	500,000	500,000	1901	J. & J.	.....	.....
(\$500,000 in escrow to retire 1st mtg. 5a.)						
Miscellaneous						
Date of Quotation—June 8, 1901						
Bridgeport Traction Co.....1st mtg. 5a.	2,000,000	1,688,000	1920	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 5a.	5,000,000	3,548,000	1901	F. & A.	118	.....
C. & W. St. R. (Ind. pols.) 1st cons. m. 5a.	4,000,000	3,000,000	1908	M. & N.	104	104
C. & W. St. R. (Buffalo) 1st mtg. 5a.	8,000,000	2,800,000	1902	M. & N.	113	112
Columbus (O.) St. Ry.....1st cons. g. 5a.	5,000,000	2,261,000	1902	J. & J.	115	.....
Consolidated Traction (N. J.) 1st mtg. 5a.	15,000,000	12,965,000	1908	J. & D.	111½	111½
Crofton St. Ry. (Colu's, O.) 1st mtg. g. 5a.	2,000,000	672,000	1908	J. & D.	115	115½
Denver City Cable Ry.....1st mtg. g. 5a.	4,000,000	3,800,000	1920	J. & J.	20	.....
Denver Con. Tram'y Co.....Con. m. g. 5a.	4,000,000	922,000	1908	A. & O.	80	85
Louisville (Ky.) Ry.....1st cons. mtg. g. 5a.	6,000,000	4,961,000	1900	J. & J.	119	119½
Minneapolis St. Ry. 1st cons. mtg. g. 5a.	5,000,000	4,050,000	1919	J. & J.	110½	110½
No. Hudson Co. Ry. (N. J.) Cons. mtg. 5a.	8,000,000	2,878,000	1920	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.) 2d mtg. 5a.	550,000	550,000	1922	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.) Deb. 5a.	500,000	489,000	1902	F. & A.	.....	.....
No. Hudson Co. Ry. (N. J.) Cons. mtg. g. 5a.	1,250,000	1,000,000	1901	J. & D.	.....	.....
Paterson (N. J.) Ry.....1st mtg. 5a.	8,000,000	2,000,000	1900	A. & O.	.....	.....
Rochester (N. Y.) Ry.....Cons. g. 5a.	5,500,000	4,298,000	1907	.....	108½	108
St. Paul City Ry.....Deb. g. 5a.	1,000,000	1,000,000	1900	.....	108	.....
(\$1,000,000 in escrow to retire 1st and 2d mtg. 5a.)						
(\$500,000 in treasury. Bonds guar. by Buffalo Ry. Co.)						
(\$970,000 in escrow to retire bonds of C. St. R.R. Co.)						
(\$87,000 in treasury.)						
(\$900,000 reserved to red. m. prior liens)						
(\$200,000 in escrow.)						
*With Int.						

*With Int' res

ELECTRIC LIGHT AND ELECTRICAL MFG. COs

Boston, Mass.						
Date of Quotation—June 8, 1901						
Delaware Gas Lt. Co.....1st m. 5a. g.	800,000	800,000	.....	J. & J.	106	104
Edison Elec. Illuminating Co., Boston...	2,026,000	.....	.....	Quar.	187	.....
General Electric Co., gold coup. deb. 5a...	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa						
Date of Quotation—June 8 1901						
Allegheny County Light Co.....5a.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Serp. 5a.	195,570	.....	.....	M. & N.	.....	.....
Miscellaneous. —(June 8 1901.)						
Edison El. Ilg. Co. (N. York) 1st m. 5a...	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilg. Co. (N. Y.) con. m. g. 5a.	15,000,000	2,188,000	1908	.....	124	.....
Edison Elec. Ilg. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122½	124
Edison Electric Light (Philadelphia)...	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Pow. Co. 1st mtg. 5a.	2,500,000	.....	1907	A. & O.	100	101
Kings Co. El. Lt. & Po. Co. pur. money 5a.	5,176,000	.....	1907	A. & O.	120	122
Milwaukee El. Ry & Lt. Co. 1st con. g. 5a.	8,000,000	.....	.....	F. & A.	102½	.....
United Elec. Light & Power Co. (N. Y.)...	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—June 8, 1901.						
American Bell Telephone.....4a.	.....	.....	1908	F. & A.	100½	101
Northwestern Telegraph Co.....7a.	.....	.....	.....	.....	.....	.....
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 5a.	.....	.....	.....	.....	114	115
Chesapeake & Potomac Teleph. Co....5a.	.....	.....	1911	J. & D.	108	106

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—June 8 1901.						
American Electric Heating.....7a.	500,000	500,000	.....	.....	.....	.....
Armington & Sims Engine Co.....	.....	.....	.....	.....	.....	.....
Barnes & Smith Car Co.....6a.	.....	.....	1912	J. & J.	106	107
Carborundum Mfg Co.....6a.	75,000	.....	1904	J. & D.	115	127
Worthington Pump Co.....	.....	.....	.....	.....	.....	.....
*females.						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 17@17½c.; Lake, 17½@17¾c.; casting, 16¾@17c.

The annual meeting of the Thomson-European Electric Welding Company will be held June 12 in Portland, Me.

The West Philadelphia Passenger Railway Company has declared a dividend of \$5 per share, payable July 1 to stock of record June 15.

The Commercial Cable Company has declared the regular quarterly dividend of 1¼ per cent., payable July 1. Books close June 20 and reopen July 2.

The Philadelphia "Stockholder" says the strength of General Electric is attributed to prospective rights in connection with the capital readjustment.

The Union Passenger Railway Company of Philadelphia has declared a dividend of \$4.75 per share, payable July 1 to stock of record June 15.

The Massachusetts Railroad Commissioners have authorized the Northampton and Amherst Street Railway Company to issue \$100,000 5 per cent. 20-year mortgage bonds.

Mr. F. B. H. Paine, a prominent official of the Westinghouse Electric Company, has been in Ottawa on business with Messrs. Ahearn & Soper, the Canadian agents of the company.

The directors of the Massachusetts Electric Companies have declared a dividend of \$2 per share on the preferred stock, payable July 1 to stock of record June 15.

The Philadelphia & Lehigh Valley Traction Company has filed a mortgage for \$2,500,000 to the Guaranty Trust Company to secure 4 per cent. bonds guaranteed by the Lehigh Valley Traction Company.

Governor Crane of Massachusetts on June 5, signed the bill permitting the Edison Electric Illuminating Company to purchase the Boston Electric Light Company through exchange of shares.

An official of the New England Vehicle and Transportation Company states that the Newport plant of the company has been sold to the New York Electric Vehicle and Transportation Company and not to private parties as announced.

The following are quotations for some of the industrial stocks not quoted elsewhere: Electrical Lead Reduction, 3½@4; Electric Boat, 23½@24; Electric Vehicle, 10½@11; Tel. & Tel. Company of America (full paid), 56@6¼; Electric Company of America, 8¼@8½; National Carbon, 15¼@16.

Advices from Nashville, Tenn., state that the Cumberland Telephone Company has decided to increase its stock 20 per cent. Stockholders have the right to subscribe to the amount of 20 per cent. of their holdings in new stock. This will increase the capitalization of the company to \$7,500,000. The new issue is for the purpose of building new lines and exchanges.

The Electric Street Railway Company of Kingston, Ont., has refused the demand of its employees, who are members of a union, for an increase in their wages. The company claims that the road is not a paying concern, and if the men go on strike the company will try to replace them with other men, and failing that, will run its cars into the barn and sell them and the whole plant by public auction.

The listing committee of the Boston Stock Exchange, has admitted to the list 36,000 shares, \$3,600,000, of the common stock of the Seattle Electric Company and 12,500 shares, \$1,250,000, of the preferred stock out of 50,000 shares of common and 12,500 shares of preferred authorized. The company was organized for the purpose of owning and operating electric railways, light, heat and power plants, etc.

It is said that Gov. Stone of Pennsylvania signed the rapid transit traction bills at midnight under date of June 8. Charters for four or five companies for Philadelphia under the names of the Northern, Eastern, Western and Southern Rapid Transit Companies with capitalization \$12,000,000 have already been asked for. Ordinances for franchising on every available street in Philadelphia are expected to be introduced in councils and passed this week.

The listing committee of the Boston Stock Exchange has taken from the unlisted department and placed on the regular list \$15,000,000 American Telephone and Telegraph Company collateral trust 4 per cent. bonds dated July 1, 1899, and due July 1, 1920. The following financial statement as of April 30 has been submitted by the company: Assets—Construction, equipment and supplies, \$16,398,952; telephones, patents, etc., \$4,903,689; stocks and bonds, \$75,306,150; real estate, \$1,633,213; bills and accounts receivable, \$5,769,884; cash and deposits, \$5,877,742; American Bell Telephone Company, \$22,110,400; total, \$131,917,030. Liabilities—Capital stock, \$94,237,500; bonds, \$15,006,000; profit and loss surplus, \$3,961,699; reserves, \$2,295,638; bills and accounts payable, \$445,982; contingent, \$15,970,210; total \$131,917,030.

The formal ratification is expected soon of the deal for a consolidation of the Philadelphia Company and the Consolidated Traction Company of Pittsburg. Stockholders of the Philadelphia Company will receive for each \$100 shares of common stock \$100 of collateral trust 5 per cent. bonds, \$20 of preferred stock and \$20 of common stock of the new company. This new company will issue \$40,000,000 of collateral trust 5 per cent. bonds. Of this, \$18,750,000 will be issued in partial exchange for the stock of the Philadelphia Company, \$12,000,000 in partial exchange for the Consolidated Traction stock and the balance held in reserve. There will be \$15,250,000 in 5 per cent. cumulative preferred stock, of which \$2,950,000 will be given in partial exchange for Philadelphia Company, \$9,000,000 in partial exchange for Consolidated Traction and \$2,400,000 in exchange for \$2,000,000 consolidated preferred stock. The common stock will be \$10,500,000 and of this \$2,950,000 goes to the Philadelphia company and \$7,550,000 to the Consolidated Traction. Each \$100 of Consolidated Traction common stock will receive \$50 in new preferred stock and \$50 in common. Consolidated preferred will get \$100 in the collateral 5s, \$20 in new preferred and \$3 a share in cash for accumulated dividends.

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EDITORIAL NOTES.

The Independent Telephone Meeting.

The Buffalo meeting of the Independent Telephone Association, which recently drew to a close, was most successful and satisfactory in every way. The attendance was unusually large and what was more to the point the sessions of the Convention were well attended. The papers that were read were few in number but were almost without exception quite thoroughly discussed and the principal points brought forcibly to the attention of the delegates. Judge Thomas, who has already done so much for the Independent cause, was re-elected President of the Association, which augurs success for the coming year. That the Pan-American Exposition was visited goes without saying, and the Bell Telephone Company and other exhibits carefully inspected. The Bell Company has an unusually large exhibit of its most recent telephonic apparatus which enabled the Independents to form a very clear idea of what their rival is doing.

The proceedings of the Convention will be found on another page of this issue.

Some Wonderful Batteries.

The saying that "it never rains but it pours" would seem just at present to apply to the bringing out of new storage batteries. Several European inventors claim to have designed storage batteries that cannot be surpassed in the way of endurance, capacity, cheapness, etc. Mr. Edison hopes to revolutionize the electric industry with his new battery recently described in these columns, while now we hear of a telephone man who is credited with bringing out a battery, which it is claimed—by a daily paper—far surpasses even that of Mr. Edison. The newspaper article states that "Walter Scott Strowger, the inventor of the automatic telephone switch which gave rise to the automatic telephone exchange now in use in several localities, has just invented an electrical storage battery that he says beats anything of the kind ever offered by Edison and the other electrical experts. Mr. Strowger's battery can be charged to an amperage so tremendous in power that it would melt other storage batteries. He also has invented, to go with the battery, a substance to take the place

of the india-rubber casing, which is superior to rubber for the purpose, and is 90 per cent. cheaper and more desirable.

"It is sufficient in point of illustration as to the value of this invention to say that Mr. Strowger stands ready to take the Empire Express train from Rochester to New York by his battery and system of electric power over the New York Central Railroad. He says his battery takes only half an hour to charge. He has discovered a new gas, similar in illuminating power to acetylene, but without its dangerous qualities, which is made out of the simplest materials, the residue of which, when made on a large scale, is of more value than the gas itself, the proceeds from the sale of which will defray all the expenses of manufacture."

After reading the above most storage battery manufacturers might be tempted to sell out their business to the first bidder, but a moment's thought will probably convince them that there is really very little to apprehend in the way of competition from such "marvels," at least for a good while to come, if ever.

* * *

The Macquarie Lighthouse.

As we stated some time ago in these columns, electricity is being adopted but slowly by the leading nations of the world as a lighthouse illuminant. France, which boasts of something like a score of electric lighthouses, has probably more than all the other nations combined, although England has a few scattered along the rocky coasts of its possessions. In this connection a communication recently received from a resident of Sydney, N. S. W., is both timely and interesting. It seems that the whole of the New South Wales coast is efficiently lighted, and when the service passes into the hands of the Federal Government, further improvements will be effected. Some of the lights are visible at a distance of 12 miles. The most important of the New South Wales lighthouses is the Macquarie, at the entrance to Port Jackson, and which ranks as one of the largest and finest in the world. It is also the grandest example of electric lighting of which the southern hemisphere can boast. The structure was commenced on March 1, 1880, and the light in connection with it brought into operation on June 1, 1883. The old lighthouse, which the new one has replaced, was built in 1816, and was the first structure of the kind in Australia. It is equal-

ly interesting, and also illustrative of the enterprise of the State, that the electric light was first used for lighthouse purposes. The light is of the first order, sixteen-sided, dioptric, holophotal revolving white light, of the system of Fresnell, showing a flash of eight seconds in every minute, and having a range of 25 miles seaward. It is, however, discernible for a considerably greater distance, owing to the luminosity produced in the atmosphere by the electric beam before the direct rays become visible.

As in most modern electrically operated lighthouses the Macquarie is provided with a supplementary light of oil or gas to be used in clear weather or in case any part of the electrical machinery should get out of order.

With full power of the electric light at the focus the mean intensity of the flashes in the direction of the sea horizon is not less than five or six millions of candles. By a simple arrangement the change from gas light to electric light at the focus, or the reverse, can be effected in ten seconds, and the flames of the oil lamp can be substituted for the gas or electric light in nearly the same space of time. The Macquarie Lighthouse is intended only to illumine half the horizon; it is therefore possible to make use of the landward rays by means of a dioptric mirror. This was probably the first instance of the use of a dioptric mirror for an electric light. Special adjustment was needed to attain the result in a satisfactory manner. The whole apparatus is carried on a round pedestal, which offers the great advantage of enabling the keeper to enter without interfering with the rotation of the apparatus. Arrangements are made to burn either gas or paraffin oil, or to exhibit the electric light at full power or half power. When the electric light is in use there is always a second lamp in readiness for action. The practical result of the lighthouse, says our correspondent, has been to make the entrance to Sydney harbor perfectly safe, except during the most violent weather.

* * *

Export Trade Transportation Facilities.

A careful study of conditions in the commercial world to-day leads one to ask whether or not the export trade of the United States is controlled by one huge monopoly, and if so, are our Government officials cognizant of this fact, and to what extent are they aiders of the monopoly.

Scarcely a daily paper and not a single edition of the trade papers can be taken up in which will not be found some letter from a United States consul urging the importance of his particular locality as a possible and probable market for some line or lines of American manufactures. Should some enterprising manufacturer or exporter take up the matter, he is sure to find, as have many others before him, an open market, but a prohibitive freight rate.

As an example of this we might mention a manufacturer who desired, a short time since, to make a shipment of a small package to the Argentine Republic, the weight of which was three pounds. As there is no parcels post arrangement between the United States and the Argentine Republic, recourse must of necessity be had to the private express companies, with the result that the manufacturer was confronted with charges on this three pound package amounting to \$6.30, the value of the

package being perhaps in the neighborhood of \$3. It will readily be seen that that particular market was very effectually closed to this American manufacturer, unless some other means of transportation could be found.

Had this exporter, however, been an Englishman, and a resident of that country, the conditions would have been different, for he would have been able to send the same package by parcels post from England to the Argentine Republic at a total cost of 57 cents. And this is only one of thousands of instances which might be cited in connection with our export trade. It may not appear, at first glance, how effectual this barrier is, until we remember that all European manufacturing countries have parcels post treaties with the countries wherein lie the new markets for American products, thus placing the American manufacturer at the disadvantage of finding after he has landed his goods subject to the heavy transportation charges of the private express companies, that he is to be placed in competition with similar goods which have been brought from the European manufacturing centers at a reduced cost for transportation, and which can, therefore, be sold at a much lower price.

These matters are continually being brought to the attention of our officials who have charge of the making of such treaties, and who have the power to aid the American manufacturer if they will, and yet very little effort is being made to relieve the situation on the part of those who should have the American manufacturers most at heart. American exporters and manufacturers, and in fact every one who is in any way interested in the successful sale of American goods in foreign lands, should insist that our postal authorities open their eyes, which now seem to be so effectually closed, to all but the dollars for which they are working, when they refuse to aid the manufacturer and exporter of the United States by making parcels post treaties with those countries in which there are new and abundant markets for just the classes of articles which can be transported so satisfactorily by parcels post.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

W. J. CLARKE, the well-known wireless telegraphy inventor, has succeeded in transmitting pictures by wireless telegraphy a distance of 15 feet and through an eight-inch brick wall.

THE second annual meeting of the Roentgen Society of the United States will take place in Buffalo, N. Y., September 10 and 11, at the University of Buffalo.

THE Crocker-Wheeler Company at Ampere, N. J., has reduced the force of State detectives that has been guarding the works against the strikers for several weeks to one man by day and three or four at night. The night shift is well established and work is proceeding as rapidly as if nothing had happened to disturb it.

THE Emperor of Austria has made Dr. Karl Auer von Welsbach a baron in recognition of his numerous valuable inventions. Dr. Welsbach is best known in connection with the incandescent light which bears his name, but it

is said that he is now seeking to do for electricity what he has already accomplished in respect of gas.

THE twentieth annual meeting of the Association of Railway Telegraph Superintendents will be held at Buffalo on June 19, 20 and 21.

CONSUL LISTON, of Rotterdam, according to the Bureau of Foreign Commerce, says that American machinery, on account of its excellent quality and finish, is rapidly gaining a foothold in the Netherlands, and that electrical appliances and hardware are meeting strong competition in cheaper articles from Germany.

It is quite evident that electricity is being used extensively in California. Not only are there many plans for the building of trolley lines out of Los Angeles to suburban towns, but San Bernardino and Redlands now come to the front with a project for an extensive system which will connect a number of towns in that section, the electricity to be supplied from the plants being built in the San Bernardino Mountains for the generation of electricity with water power.

A DEMONSTRATION has just taken place on the Palatinate (Bavaria) railways of a means of communication between suburban localities and the stations at which the express train stops, says the "Electrician," London. The first two trial sections were between Ludwigshaven and Neustadt (30 km.), and between Ludwigshaven and Worms (22 km.). The system of traction in use is the storage battery method, there being four long coaches, each of which can travel separately or combined in a train, with trailer cars when necessary. The weight of each car, with a full complement of passengers, is 53 tons, of which 15 tons represent the weight of the storage batteries. The normal speed of the cars is 45 km. per hour, and 24 journeys are accomplished daily over a distance of 440 km. In addition to the above mentioned lines, the cars are employed on other routes. It is understood that this feeder service, which has been found to work out at a less operating expense per car mile than if steam locomotives had been employed, has stimulated the traffic to and from the suburban stations.

THE Port Talbot Steel and Iron Company in England, so it is reported by an exchange, is erecting a new steel rolling mill, and as this will be the most modern in that country and probably the first new mill in which a complete equipment of electrically-driven machinery has been adopted, a short description of the plans may be of interest. The installation consists of a compound horizontal engine capable of developing 600 hp., with a steam pressure of 150 lbs. per square inch, driving on to a pair of generators, each being capable of giving an output of 200 kw., or collectively 400 kw., equal to 540 electrical horse power at the terminals. The current is utilized for working a 60-ton crane for the casting pit, this crane being fitted with four electric motors, i. e., one motor for heavy lifts, one motor for low lifts and for tilting the ladle, one motor for longitudinal traverse, and one motor for cross traverse. Over the casting pit a 10-ton crane of the three motor electric type is being fitted dealing with the ingots and bringing them to the rolling mills.

A MONOGRAPH on forest extension in the middle West, just issued by the Agricultural Department, contains some interesting information about telegraph, telephone, and electric power and light poles. The timbers most used for these purposes are tamarack, white cedar and red juniper. Their value is fully known, and if the supply could hold out nothing would displace them. Their life in the ground is about ten years, so that every decade sees one generation of poles worn out and another cut to replace it. To the poles required for renewal is to be added the number required for new lines and systems. The total is very large. The telegraph lines of the country require nearly 600,000 poles annually, at a cost of not less than a million dollars, and the telephone and electric car lines and light systems use as many more.

THE French automobilists, M. Charron and M. Henri Fournier, say they have decided to cross the Atlantic for the Buffalo-Erie race. M. Fournier will have the Mors machine with which he recently won the Paris-Bordeaux contest. M. Charron is going to have a new one built as soon as he knows the character of the roads. M. Charron, "le Roi des Chasseurs," says he is coming over on racing and business.

A NUMBER of contracts have lately been let in Colorado, among them are—to electrify the National Refrigerating Company's plant at Canon City; to put in an entirely new apparatus for the Hamson Creek lead mines at Lake City; to equip the Seaton Mountain Electric Company of Idaho Springs with three generators and a rejuvenated plant generally; to furnish electrical propaganda for the Colorado and Southern in its Alpine coal mines. The National Refrigerating Company will probably equip its Colorado Springs ice plant with electrical machinery. This plant freezes 300 tons a day, and the Canon City plant has a capacity of 200 tons daily.

THE first spadeful of earth in the Bronx excavation of the Rapid Transit was turned June 13. President Haffen, of the borough; John McDonald, the contractor; Chief Engineer Parsons, of the Commission, and Councilman Hottenroth helped the ceremonies by attending. Mr. Haffen declared that the work would be done in six months less than contract time.

YESTERDAY and to-day the annual convention of the Pacific Coast Electric Transmission Association met at San Jose, Cal. Street and electric light and power men from all over the Coast are present. A special feature of the meeting is experiments with the long-distance current of the Standard Electric Company, whose wire is 184 miles long, from the North Yuba River, in the Sierra Nevada Mountains. Recently a current of 60,000 volts was sent over the wire as a test. The company is now prepared to send regularly a current of 40,000 volts.

MR. W. O. WOOD, in a paper read before the North of England Institute of Mining and Mechanical Engineers on April 13th, deals for the most part with the Sussmann lamp, which he has used at the Murton Collieries since 1897, 1,000 lamps now being in daily use. The lamp is now made with battery weighs 3½ lbs. and has a capacity of 5½ ampere hours at 2 volts, maintaining the lamp for 8 to 10 hours with one charge. The life of the battery has averaged 10 months.

The Independent Telephone Convention.

One of the Largest Meetings Ever Held by the Association—Several Valuable Papers Read—Bell Methods Denounced—Judge Thomas Re-elected President.

The Independent Telephone men left Buffalo last week well pleased with the result of their Convention—which was the largest attended of any Convention yet held by the Association.

The meetings were held in Convention Hall, and the first day's session (June 11) brought together a large assemblage of delegates, who were called to order by the President, Judge J. M. Thomas. He introduced Mayor Diehl, who made a brief address, saying that he welcomed the Independent telephone men because they represented a principle of vast importance in all industries, namely, "competition is the life of trade."

The President's Address.

Judge Thomas, in his Presidential address, reviewed the work of the Independent Association since the organization was started. He said:

"The past year has been one fraught with important events in the telephone world, and the great work that has been accomplished is the highest commendation that can be offered to the great army of workers in the field. Having been in close touch with all the great independent organizations of the country and knowing their present status, I do not hesitate to say that all doubt of the permanency of the Independent telephone movement has passed. Doubters have become its advocates, while the voice of the false prophet is no longer heard in the land, and his writings have been placed in the archives of oblivion bearing the inscription above its portals, 'Failure.'"

"The work in the Middle West, North and South, the greatest fields of activity in telephone development, is to be followed by very active development in the extreme Eastern and Western sections of the United States, and in a short time the organizations, now nearing perfection in these sections, will show a development that will be highly gratifying to those of us who for several years have labored in the fields now more fully developed."

"In speaking of the conventions held by this organization I have heard several gentlemen who have attended them say that the general tone resembles more political conventions than conventions of allied business interests. I have always agreed with that statement with a limitation that they have been somewhat like political conventions would be with the politics eliminated. Like public conventions we have never lost sight of the principles of progress and fair dealing with the people, and being so different from meetings of the men who control the Bell Companies, this impression has found lodgment in some minds. But this spirit, being the surest sign of the fundamental principles of progress, we desire that it shall always be the keynote of all conventions of the organization."

"There has been much inquiry, not only on the part of those who have control of this field

of investment, but also by those desiring to enter, as to the underlying principles that actuate the development of this movement. To fully and properly answer that inquiry requires a careful study of the entire history of telephony and would require more time than those of us who are actually engaged in construction and operation have been able to give to the subject; but a glance over certain events and certain policies will be of interest and profit to persons seeking the knowledge desired by the prudent man before investing in the building of telephone properties."

Judge Thomas then gave a brief history of the telephone and the several patents obtained, paying a tribute of praise to Mr. Edward P. Payson, of Boston, the attorney, and his assistants, "who defeated the skill and cunning of those who were employed to try to deceive our patent officials and courts." In concluding his address, the President said:

"This combined effort has resulted in the decision of Judge Brown, in which he holds: First, that at the date of the application, June 4, 1877, Berliner had not made the invention covered by the patent issued to the American Bell Telephone Company on November 17, 1891. Second, that the invention designated in the patent is radically different from the invention described in the application. Third, that the invention was previously patented by Berliner. Fourth, that Edison was the prior inventor. Judge Brown agrees with the well-known position of all telephone inventors that Berliner, so far as his claim to a microphone is concerned, invented nothing."

"These facts, together with the policy of the Bell companies in dealing with the people, has been the chief incentive to invest in this field. The people were anxious for relief from their arbitrary methods, and have always welcomed an independent company."

"Having proven our legal right to give telephone service by good and efficient methods, and having demonstrated our ability to compete with the old companies, it becomes now a question of working together for one common end, and it is important that at this meeting we consider such questions as will lead us to unity of action. The present year will add much to our present strength by placing a large amount of money at our disposal."

At the close of the address the meeting then adjourned until 10 A. M. Wednesday.

WEDNESDAY'S SESSION.

The Convention was called to order at 10 o'clock, and Hon. S. P. Sheerin, of the New Long Distance Telephone Company of Indianapolis, read a paper on "Village Exchanges and Farmers' Lines." He referred as follows to the growth of the Independent movement in his own State:

"When the first Independent telephone exchange was constructed in Indiana, my State, the Central Union Telephone Company had been paying, for 12 years, on a capital of \$6,300,000 (three-fifths of which was pure water) annual dividends, ranging from 4 to 6 per cent. They had no bonded indebtedness and no floating indebtedness, that was reported. When the fight with the Independents began they ceased paying dividends—the last one being paid in 1895. In 1897 they borrowed \$2,500,000; in 1899 they borrowed \$6,000,000—two and a half of which was set aside to pay the holders of the first mortgage of two and a half millions. They now have, in addition to this \$6,000,000 mortgage (according to recent publi-

cations), a floating indebtedness of \$1,250,000. Now, let me tell you what all this has resulted in. The Central Union now has (as shown by their own figures) 22,000 telephones in the State. The real number is smaller than this but we can afford to be generous. and I propose to give them all they claim. The Independent telephone interest have, in the State of Indiana, by actual count, 52,469 telephones. I know you will excuse me if I repeat those figures. After a 'war expenditure' of \$7,250,000, begun upon the Independent movement when there were less than 3,000 Independent telephones in the State, the Central Union now has, for its expenditure, 22,000 telephones and the Independent movement has 52,469."

Mr. J. B. Ware of the People's Telephone Company, Detroit, discussed Mr. Sheerin's paper and claimed that the Independents were now giving much better service than the standard achieved by their old rivals. Even the apparatus was now generally superior.

Mr. Charles E. Wilson, of the Keystone Company of Philadelphia, apologized for not preparing a paper on "Independent Telephone Development East of the Alleghanies," saying that work on his new exchange demanded all his time. He, however, invited the Convention to meet in Philadelphia next year, and pledged the delegates a grand reception.

Senator C. W. Kline, of Hazleton, Pa., president of the Interstate Telephone & Telegraph Company of Pennsylvania, then read a brief paper on the subject assigned to Mr. Wilson. Mr. Kline said that under the management of Mr. S. E. Wayland, plants had been installed in Scranton and Wilkes-Barre, covering the Lackawanna and Wyoming Valleys, with an easy possibility of 30,000 telephones in sight, and 7,000 now at work. Allentown has a splendid system, with a possibility of 5,000 telephones, with about 1,800 installed. Reading is being built. Easton is working up the lower Lehigh. The Overland of Lehigh reaches out its tentacles for everything in sight. The Anthracite of Hazleton, embraces everything in lower Luzerne, Upper Carbon and Northern Schuylkill Counties. The Standard of Bucks and Montgomery is now being rebuilt by Mr. G. S. W. Brubaker, covering all that section. The United Telephone Companies embrace Norristown, West Chester, Lancaster, Lebanon, all of the Schuylkill, Northumberland, Montour and Columbia Counties, and the north and west branches of the Susquehanna. Harrisburg is building also Columbia. York connected with Carlisle via Chambersboro is extending its lines in every direction in York and Lancaster Counties, and is connected west to the Alleghanies. As to New York State, he remarked that fine plants had been installed at Rochester and Albany. The United Telephone Company of Pennsylvania covered the southern portion of New York State. The Maryland Telephone & Telegraph Company had a splendid plant at Baltimore, and the chain of independent companies stretched south along the Atlantic to the Gulf of Mexico. He predicted that in a very short time the Independents would have in the territory east of the Alleghanies more telephones than the Bell would have in the same State both east and west of that range.

Mr. C. E. Stinson, of the Rochester, N. Y., Telephone Company, followed Senator Kline, and gave with considerable detail an account of the systems in Rochester. They have at present some 3,600 in service in a population of

160,000. The Bell people claim 2,200. He had about 160 miles of pole line, and had everything covered within a radius of eight miles of Rochester. With them, farmers' lines were different from what they had been hearing about, and brought \$40 to \$50, five-year contracts, payable quarterly in advance. Mr. Stinson closed by inviting the Association to visit Rochester.

So much time was spent by the speakers that the Convention concluded to hold no afternoon session and adjourned until Thursday morning, the Association in a body visiting Niagara Falls in the afternoon.

THURSDAY'S SESSION.

President Thomas called the Convention to order at 10 o'clock, and announced the reading of a paper by Mr. L. W. Stanton, switchboard manager of the Cuyahoga Telephone Company, Cleveland, on "Exchange Service," accompanied by a number of load diagrams. Mr. Stanton divided his subject into three important branches—reliability, promptness, good transmission. Any of these, if not up to its highest state of perfection, mars the general result.

Mr. Stanton's paper was quite lengthy and replete with good suggestions, one of which was as follows: "The telephone business stands to-day on a higher plane than ever before. The Independent movement has forced the Bell Company to put forth their best efforts, and this in turn has stimulated the Independent companies, but telephony is yet far from its ideal goal. Look through the operating rooms of some of the large Bell and Independent companies and notice the number of idle operators, while on the same boards there are operators that have more calls than they can properly handle. Few telephone men seem to have realized the importance of equalizing the load among the operators, that is, placing enough lines in front of each operator to properly load each position."

The next paper on the programme was read by Hon. E. B. Fisher, of the Citizens' Telephone Company of Grand Rapids, Mich., on the subject of "Bell Methods." Mr. Fisher's paper scored many points against the Bell management. He said:

"A large number of the brightest men in telephony have found employment in the independent field, and there is scarcely one in this Convention Hall who has not had frequent opportunity to secure many more of the most important employees of the Bell Company than he has had places for. We have been surprised at times at the seeming lack of loyalty to their employers by those who have been so long on Bell pay-rolls. Perhaps a little analysis of Bell methods may explain this situation and furnish a warning for ourselves. The rewards among the employees of the Bell heretofore have not been great either in salary or opportunities. They have been made to feel more like machines than human beings. In many cases they have not had their inventive tendencies encouraged by proper compensation for what they produced; indeed, they have been compelled to part with their inventions on the theory that their brains as well as their labor belonged to their employer, or because there was but one market for their invention and devices. That market could set its own price upon what it bought. Such conditions are not conducive to loyalty, or to inducing energetic service. The Independents, if they shall copy Bell methods in this respect, will

make a grievous mistake. If you should wake up some fine morning and hear that you have sold, or are about to sell, your telephone plant to the Bell Company do not consider that the transaction is necessarily closed. If you hear similar reports as to actual or impending sales of other Independent companies in your own or other States, be not disturbed thereat, nor convinced that the news is reliable. There have been some such sales, but vastly more rumors of those which never have occurred and do not seem likely to. There have been methods in these rumors. For some reason, some interest, evidently not Independent, has believed it desirable to circulate such reports, probably in the hope that other Independent interests might be disquieted or discouraged, and yield more readily to apparently advantageous offers. These methods have been relied upon to produce serious effects. Keep yourself and your neighbors advised of the strength and growth of the Independent movement, of the strength of their own situation in competition, and fewer such rumors will be verified hereafter."

A request was read by the Secretary from the president of the Business Men's Central Council of Buffalo asking for particulars as to the cost of equipping an up-to-date exchange.

Senator Kline referred to the able work performed in Washington by Judge Thomas and called for a rising vote of thanks to the President. Of course every delegate was on his feet when the question was put.

Mr. H. D. Critchfield delivered an address on "Legislation and Litigation," and then offered the following resolutions, which were unanimously adopted:

Resolved, by the Independent Telephone Association of the United States, in Convention assembled at Buffalo, N. Y., June 11, 12 and 13, 1901, that the thanks of this Association and of all persons who are interested in the welfare of the Independent telephone movement of the United States, is due to the officers of this Association for their faithful, intelligent and untiring efforts to promote the welfare of Independent telephony; and be it further

Resolved, That thanks are especially due to Hon. R. S. Taylor, E. P. Payson, and others enthusiastically associated for the work done in the litigation recently decided by Judge Brown in the United States District Court for the Northern District of Massachusetts, involving the validity of the so-called Berliner patent, and that successful conduct of this litigation is fully appreciated by this Convention. Be it further

Resolved, That the Secretary be and is hereby instructed to prepare and forward to the persons herein named copies of this resolution.

Invitations to hold the next Convention at Philadelphia, Rochester, Milwaukee, Mansfield and Louisville were referred to the advisory board.

Mr. Young (in the chair) appointed a committee of three to select a ticket for the ensuing year. The following ticket was reported and enthusiastically endorsed by the convention:

President—J. M. Thomas, Chillicothe, O.
First Vice-President—H. C. Young, Columbia, Pa.

Second Vice-President—C. E. Stinson, Rochester, N. Y.

Third Vice-President—W. H. Durin, Cedar Rapids, Ia.

Secretary and Treasurer—S. P. Sheerin, Indianapolis.

First Assistant Secretary—J. B. Ware, Detroit.

Second Assistant Secretary—C. E. Wilson, Philadelphia.

Third Assistant Secretary—J. B. Lee, Pittsburgh.

The Auditing Committee—Messrs. Black, Ware and Kline—reported finding the accounts of the Association in satisfactory shape.

The Convention then adjourned.

A COMPARISON OF THE BELL AND INDEPENDENT SYSTEMS AND METHODS OF OPERATION.

BY R. MAX EATON.

From a disinterested standpoint a comparison of the Bell and Independent systems and methods of operation might bring out points which are possibly overlooked by those whose minds are entirely enveloped by the interests at stake on either side, or who may permit themselves to be influenced to a degree by party prejudices. It is to a certain extent a characteristic of human nature to magnify the mistakes of the enemy and to reserve an expression of commendation of the points of virtue so much so as to sometimes overlook entirely valuable points of advantage.

The Bell through years of experience should and certainly has gained a great amount of valuable information relative to apparatus, systems and methods of operation and has almost reached the point of establishing a natural monopoly. Exception will at once be taken to this latter assertion, but let us look further into the matter. The Bell is now placing the very latest apparatus and systems in the larger cities, discarding in some instances boards and instruments which have been installed only a couple of years, and developing its long distance and toll line service to the highest state of efficiency and ignoring almost entirely towns and country places. The reason of this is that it has long since learned the fact that the great profits of the business is in the large cities and comparatively little revenue is derived from small isolated country exchanges other than long distance work. Thus we see in the smaller towns and cities Independent exchanges springing up opposing the Bell systems and meeting with no vigorous defense from them. In these small places we see the Independent companies installing a great many more instruments than the Bell attempts to secure, and operating good up-to-date systems, whereas we find the Bell operating in a great many cases the old Blake transmitters on ground lines and with antiquated types of boards. We cannot help but note, however, that in all these instances the Bell has put forth an effort to bring its toll conditions to a high degree of efficiency.

The question then arises, why does not the Bell put forth a greater effort of defense for the local work by improving the systems, increasing the subscribers and lowering the subscription rates to meet the Independent? It is simply that the spoil is not worth the battle. The cost of maintenance is so high and the yearly subscription so low that the profits on local work are not by any means an item for consideration. In these places the Independent companies are operating at a profit that would be impossible for the Bell to derive.

In the small places the systems most generally used by the Independents are very much superior to the Bell and as a rule give considerably better local satisfaction. The engineering problems in these cases fail to enter at all into the situation and do not become a matter for consideration to any degree.

In the larger centers of population, however, the scene is very much changed, and we find the Bell putting forth every effort to firmly establish itself, not so much now on the lines of a monopoly, however, as on the principle of

an indispensable industry. It is placing the latest equipments at considerable expense, putting in the very best construction, placing instruments which may probably be equalled but are unsurpassed, and are using every endeavor to secure extended contracts with railroad companies, express companies and large industrial establishments, perfecting the toll systems and using every power at its disposal to fortify against intrusion. This is being done probably to a great extent because the day of valuable unexpired patents is past and that cannot now be held before the capitalist as an intimidation.

The Independent companies have not yet to any extent opposed the Bell in the large cities, although just now we see on every side signs of this being started, and in fact in some large cities there are already individual exchanges. Their metal has not, as we said before, been tested by the establishing and operation of small exchanges, but now we will see as they attack the Bell's most modern systems, varied experience, perfected apparatus and established operative facilities, the brains of the very best engineers pitted against each other and the executive abilities of the managers and financiers struggling for supremacy.

The Independents have to face the fact that the Bell has an established industry, long contracts, perfected systems, the cost of maintenance reduced to the lowest possible point, perfected, trained, and organized systems of operation, maintenance and equipment and an organization complete for grasping at once the loopholes of advantage. In its toll work its equipment is uniform, and regardless of where you wish to talk over its long distance lines there is the advantage of both ends of the line having equally efficient equipment.

In opposing all these conceded points let us see in what manner the Independent companies propose to attack and whereby they expect to secure the larger or even a proportional share of the business. In the first place they have at their disposal some excellent systems, which none, however, will dare say contain enough points of superiority over the Bell to ensure success alone on that standpoint. The point might be raised that the Independent can give a great deal cheaper rates on account of the royalty drain of the Bell, but do we suppose in a battle for supremacy that would be allowed to stand in the way? Have we not however gotten the public who have been oppressed for years by high rates as the friend of the Independent? The public have no friends where the pocket is concerned and the ills of the past are soon forgotten in the whirl of business. Have the Independents a chance in long distance work where every town and city is equipped with different apparatus even if a sufficient trunk system is constructed or secured? It cannot be possible that the Independents are saying to the Bell, "We know more before we start than you have learned in twenty years," and is the Bell laughing in its sleeves and saying, "Wait and see; you have not commenced to enter the realm of telephony until you have tried to operate twenty-five or fifty thousand subscribers in a large city."

If the Bell can control the large industrial centers then the profits of the country places worth securing are in its grasp. Are we led to believe then that the Independents propose attacking the Bell on their own battle-field, with no other weapon than cheaper rates to secure

the supremacy? It would appear then like a tremendous undertaking because the public will not be burdened for a great length of time with two telephones, and it will evolve finally to a question of endurance during which time none will be benefited.

Let us do then as the general did when his army faced an almost insurmountable barrier, see if there is not another way around. Are we to believe that the attack is to be made on stereotyped lines or that the possibilities of the telephone have been reached and can be extended only on the same lines and within the same scope of usefulness as now presented?

In no place is the percentage of subscribers greater than 5 per cent. of the total homes of a city, and in very few instances has that been reached, and because it is impossible to operate and maintain a system which will come within the financial reach of the remaining 95 per cent. Then we are to believe that because a telephone system cannot be operated and maintained at a less cost than \$1.50 per station per month that the 95 per cent. must remain without the advantages offered by it. Would this 95 per cent. have any use for a telephone anyway? It would if it would supply their wants. In the present capacity of its uses it would be more ornamental than beneficial. The telephone in its present capacity must exist because it has now become an indispensable industry, but it can be extended to the remaining 95 per cent., not, however, as we see it now, but as a more useful and less expensive convenience. Why should a subscriber have to pay for a telephone at all directly? Would not any enterprising firm place a 'phone in a home if by so doing the trade of that home could be secured to them. The individual wants of any home of the 95 per cent. are common to all and why not be supplied from a common source? If I have a telephone in my home why should I have to communicate any farther than a central point to secure practically anything I require? Why not a business exchange instead of a telephone exchange? If I have a telephone why cannot I use it to order provisions, receive and transmit messages, secure information, call physicians, get stock quotations, request tradesmen, and the hundreds of other common necessities without having to go farther than the central? Why should I have to call any one else than central to secure any of the necessities which are common to all? To accomplish this then central will only require to be a business exchange instead of a telephone exchange. We do not wish to say that an exchange of this description would at all replace the telephone as we know it to-day, but in combination with it would develop a means of now getting over all the difficulties, heretofore encountered in placing the convenience of the telephone at the disposal of all homes.

Then would not any company gladly place the telephone in any home in a town or city, if by so doing it could centralize and control the trade? Would it not also be an advantage for the home to be in instantaneous and direct communication with the supply center? The telegraph companies now place call boxes free of charge, for the sake of securing only the telegraph business, which, when compared with the other, dwindles into insignificance.

Also this same telephone, while not used for business, should supply the home with entertainment, music, Sunday sermons, etc. When prominent men speak in a town or city any-

one should be able to sit in their own home and hear it.

When such a system is placed before the public then the scope of the telephone will just have commenced and the connections will be placed in houses as a matter of course, the same as water and gas, and it will become a fixed and indispensable part of every household.

This is by no means an electrical improbability, but as far as that is concerned is a demonstrative possibility.

The telephone problem will eventually be solved on some such lines as this, and then will the monopolies as we now know them meet their Waterloo.

EQUIVALENT EVAPORATION.

BY W. H. WAKEMAN.

This term is used much in engineering practice, and as it refers to a most interesting part of the calculations that a competent engineer must understand, a short article on the subject will help about making plain a matter that appears complicated to some men in charge of steam plants. The last word in the title means the process of "converting water into steam in a closed boiler," when used in this connection, and the first word means "an equal amount," therefore the complete title refers to the process of comparing the amount of water evaporated under stated conditions with the amount that is evaporated by the application of a given amount of heat, applied under conditions that have become a standard on account of their adoption by eminent engineers for this purpose. Heat can be measured, bought and sold the same as any other commodity, and the unit of measurement for this purpose is very properly called the "heat unit." It means the quantity of heat that is required to raise the temperature of one pound of pure water from 39° Fah. to 40°, or in other words to raise one pound one degree.

The amount required to raise it say from 200° to 201° varies slightly from the above, but inasmuch as the difference is so small it is customary to call it the same for all temperatures, and the error is unworthy of consideration, while the process is very much simplified by so doing. If a boiler is carrying 70 pounds pressure by the gauge, and the feed water is supplied at 100° Fah., the amount of heat required to evaporate one pound of it is found by subtracting the temperature of the feed water from the total heat of the steam.

The total heat is 1,210 heat units and the temperature is 100° Fah., or in other words, one pound of the steam contains 1,210 heat units, and one pound of the water 100 heat units. Then $1,210 - 100 = 1,110$ heat units. When an engineer is using a table of the properties of saturated steam for the purpose of making calculations in equivalent evaporation, he should note whether the pressures given are absolute or above the atmosphere; also whether the total heat is above zero or above 32°. To illustrate this point take a table in which the pressures are absolute. If the boiler pressure is 70 pounds, it is necessary to add 15 to it and look for 85 pounds in the table. If the total heat, or the heat units, are given above 32°, it will not answer to subtract the temperature of the feed water from this total heat as given, because the tem-

perature of the feed water is reckoned from zero, therefore 32 must be added to the total heat.

The above-mentioned conditions are a standard with which all others may be compared, and in order to make the process plain, an example will be worked out in full.

Suppose that during a test lasting ten hours, 6,720 pounds of coal were burned, or 672 pounds per hour, and nine pounds of water were evaporated by each pound of coal, making 6,048 pounds of water evaporated. The steam pressure was 120 pounds by the gauge, and the feed water was heated to 212° by exhaust steam. Under these conditions it requires 1,008 heat units to evaporate each pound of water, or 6,096,384 heat units for 6,048 pounds. As it requires 1,110 to evaporate each pound under standard conditions, we must divide by this number in order to determine the equivalent of it in the standard given us. $6,096,384 \div 1,110 = 5,492$ pounds, therefore the evaporation of 6,048 pounds under actual conditions is equal to evaporating 5,492 pounds under standard conditions. As the latter is less than the former let us note what causes the difference. 6,096,384 heat units were used and if we divide this amount by the number of heat units required for one pound under standard conditions we get a smaller number than when we divide it by the number required under the actual conditions, because the former is greater than the latter.

A problem in equivalent evaporation may be solved by using what is called the "factor of evaporation." This is determined by dividing the number of heat units required to evaporate one pound of water under actual conditions by the number required under standard conditions. In this case it is $1,008 \div 1,110 = .9081$. The pounds of water actually evaporated must be multiplied by this factor to get the equivalent evaporation, and in this case it is $6,048 \times .9081 = 5,492$ pounds as before. The evaporation of 30 pounds of water under standard conditions constitutes 1 hp., therefore if we wish to determine the power developed by this boiler we have $5,492 \div 30 = 183$ hp.

There is another standard which is given us for calculating equivalent evaporation, and when it is used for determining the horse power actually developed by a boiler, the results are practically the same as before. This standard refers to the number of heat units required to evaporate one pound of water at 212° into steam at atmospheric pressure, the total heat of which is 1,178 heat units, therefore it requires $1,178 - 212 = 966$ heat units to evaporate one pound of it.

The factor of evaporation is found by dividing the heat units required under actual conditions by 966. In this example it is $1,008 \div 966 = 1.0435$; 6,048 pounds of water were actually evaporated, and $6,048 \times 1.0435 = 6,311$ pounds on a basis equal to this standard.

It requires 34.5 pounds of water evaporated to constitute 1 hp. when this standard is used, and $6,311 \div 34.5 = 182.36$ hp. In these calculations the fractions have been omitted as this makes the matter more simple and affects the results but slightly.

An application of the principles herein laid down will enable an engineer to determine the power actually developed by any boiler, when the pounds of water evaporated, the temperature of the feed water, and the steam pressure are known.

BATTERIES USED IN TELEPHONY.

BY P. KERR HIGGINS.

(Concluded from page 366.)

In measuring internal resistance of a cell it is best to use the current from the cell under test, through a known resistance, then measure the EMF. at the electrodes with a voltmeter while the current is flowing, and again with circuit open and no current flowing. The difference in volts will indicate the drop in potential due to the flowing of the current against the internal resistance of the cell; which can again be found

by applying Ohm's Law: $c = \frac{\text{EMF.}}{R}$ and R (of cell) $= \frac{E}{c}$ (difference in volts between the two tests) divided by the current (c).

Storage batteries, or more correctly accumulators, may be defined as a combination of elements, so arranged and charged as to form an electric source of supply; like primary cells they depend on chemical action for their operation. So far we have treated primary cells only, or those using liquid depolarizers; those now under consideration, using oxides of lead, commonly known as litharge peroxide of lead (PbO_2), or minimum (Pb_3O_4), come under the class of secondary cells or accumulators.

There is very little difference between the primary and the secondary cell, the principal one being, that when exhausted, the latter can be restored by passing a current through it from another source of supply. In their normal state, the elements of an accumulator are non-electric, but when a current has been passed through them in a given direction, they are ready for service and perform the functions of a primary cell, and in their construction this end is constantly kept in view.

It should be remembered that the current charging the cells must always be in the opposite direction to that coming from the charged cell; therefore during charging the plate at which the current enters is termed the positive (+), and for technical reasons (one of which is that the potential of this plate is always highest) this plate is termed, at all times, the positive plate.

The form of accumulator most generally in use is that having lead for the foundation of both plates, and these are separated from each other by hollow glass tubes running the whole length of the plates. Many forms of plates are used, but the one which I have found to give the best satisfaction is one in which zinc chloride and lead chloride is melted and run into small molds which have a bevel edge; these are pressed into a second mold and an alloy of lead and antimony forced between the pellets; this is then passed through a third process, dissolving the zinc, and leaving practically a solid lead plate filled with plugs; these are used for the negative plates and a plain plate is used for the positive. The current being sent through, forms the porous part of the lead plates into peroxide, and the cell is ready for use. These are almost exclusively used in common battery systems, because of their low internal resistance, .002 ohm, and their uniform discharge, enabling us to maintain a comparatively uniform EMF. at the subscriber's station at all times, thereby maintaining a uniform service and saving the expense of maintenance of batteries at distant points. They are also very easily restored when run down, and when properly installed and cared for, only the

initial cost need be taken into account, as nothing more needs to be added but distilled water and very rarely a little dilute sulphuric acid.

The action which takes place in an accumulator is, on passing a current through, the water is decomposed, oxygen combines with the positive plate, producing a current in an opposite direction to that applied. Repeated applications of the current increases the surface of the positive plate, both plates becoming more or less soft and porous, especially on the surface, and are liable to injury if not carefully handled. This process is termed forming and is very slow. In order to hasten this forming process litharge is spread or applied in some special manner to the surface of the plates, so that, on applying the current, it is turned into peroxide on the negative and spongy lead on the positive. In many cases this is forced into holes in the plate under hydraulic pressure, as already stated, and gives good results, or is cast into grids and lattice work; some plates are made hollow in the center and both sides filled with small holes, the hollow portion of the plate being filled with lead peroxide (Pb_2O_3) or some other combination of lead oxide. In many cases the dry powder is forced into the plates, under enormous pressure, so that the powder is practically solidified. These plates are immersed in a solution of dilute sulphuric acid, 1.17 specific gravity (1 part acid and 5 parts distilled water), and when all the active material, on the negative and positive plates, has been completely reduced to the new substances already stated, no further action takes place, except the decomposition of the water; continuing the charge produces what is known as the sign of a fully charged cell, namely, milky or boiling, and beyond this point, further charging is only a waste of energy. When the cell is put in use (after charge has ceased) the flowing of the current in an opposite direction reduces the lead peroxide, on both positive and negative plates, back to lead oxide and lead sulphate respectively. A cell in good condition has the positive plate a deep red or chocolate color and the negative slate color. Great care should be taken to avoid white patches, known as sulphating, as when these are released by charging they generally take with them some of the active material, thus destroying the efficiency of the cell. The white sulphate thus formed by discharging the cell too low, increases the internal resistance of the cell, produces cross-talk, etc., and may be avoided by not continuing to discharge the cell below 1.8 volts. Buckling or warping of the plates comes from the same source and should be avoided. The plates should never be left exposed to the air in a dry state, nor should the cell be left standing uncharged, as both produce white sulphate.

The specific gravity of the electrolyte should be kept up to 1.200, and this can only be done by keeping them well charged; it is not always necessary to add acid when the specific gravity falls below this, but charging is needed as sulphuric acid is formed during charge and decomposed during discharge. The voltage of all cells is given at 2 volts, which during charge should be about 2.5 volts, falling rapidly, after ceasing the charge, to 2 volts. They are rated according to ampere hours (found by multiplying amperage by hours discharging) and generally run about 4.5 ampere hours per pound of plate (both elements). The discharge rate is about .02 amperes per square inch of surface of the

positive plate. Resting the battery in a charged state is helpful and should be done occasionally; but under no circumstances must they be rested in a discharged state. The larger the cell, the lower the internal resistance when charged. If there is the slightest suspicion of sulphating it is best to continue the charging, at a moderate rate, beyond the boiling point, as this will gradually remove any white sulphate. The time taken to fully charge the cell divided by the time taken to discharge it to 1.8 volts will give the percentage of loss. The life of a cell cannot be given, as conditions vary, but a well formed and constructed positive plate, with moderate use, should last about five years if properly cared for. The negative plates, with same care, fifteen to twenty years. It will be real economy to have enough cells to be able to discharge at a moderate rate, as the life of the cell will be longer and results more satisfactory. The cells, for large telephone installations, are usually put up in lead-lined wooden tanks, water-tight and painted with asphalt. The cells usually contain several plates welded together so as to form one positive and one negative plate, so arranged that each plate or section has opposite it the surface of the opposite element. They are usually $\frac{1}{4}$ inch thick and square, between them are glass tubes as insulators and the proximity of the sections can explain the necessity for avoiding buckling, which would short circuit the battery. The lugs of all the sections (or segments) are welded together by a hydrogen flame, making them one solid mass. Over the top is placed a sheet of glass to condense the water as it evaporates and passes off in the boiling stage, these sheets of glass are insulated from the plates by hard rubber stools. There are, as in primary cells, many kinds of accumulators, but they differ only in the arrangement of the plates and in details, the principles and care being the same. For the transmitters on switchboards, two cells will be found sufficient; while for line signaling at least ten will be necessary. The average cell has about .002 ohm internal resistance and the external resistance must be kept as low as possible to obtain the best results.

The wires from the transmitters should not be less than No. 12 B. & S. and terminate on a heavy copper bus bar, having wires connected to the accumulators of No. 0 gauge well insulated. One transmitter is generally allowed to each ampere hour of the cell's capacity for each 24 hours.

Two sets are generally provided, one being discharged while the other is being charged; but lately the tendency has been to use only one set, charging while in use and overcoming the noise due to the charging by using a large choke coil. The charging may be done in two ways; in small installations, the ordinary 110 volt lighting circuit may be used and the lamps, already in service, used as a resistance; or in larger installations, special machines may be provided. The lamps serving as resistance should be connected in parallel. One-half ampere lamp should be used for each half ampere of charging current necessary. The following will greatly help in the maintenance of this battery. The state of charge can always be known by taking specific gravity readings of the electrolyte. Nearly all hydrometers have a red line drawn around the 1.200 mark. When the plates are immersed in the solution for the first time, gas bubbles will be observed

to rise from the plates to the surface, due to local action and causing the specific gravity to fall; but on being charged, this will rise again and more acid should not be added, as is frequently done through ignorance of this fact. It is safe to continue the charging as long as the specific gravity continues to rise. In adding water, always use a syringe, thereby enabling you to place the water at the bottom of the cell so that it may be thoroughly mixed with the acid. Never allow the specific gravity to fall below 1.175. Note carefully the specific gravity at beginning and end of charge and you will know the fall due to discharge, and thereafter can tell, at any time, the condition of the cell; for example, if the specific gravity reading is 1.200 at the end of the charge and falls to 1.175 at end of discharge, it will be about $\frac{1}{4}$ discharged when reading shows 1.188, and so on. You cannot tell how much charge is left by the voltage. The batteries should be examined carefully with an electric lamp, so shaded as to throw the light clear through the cell to the bottom, so that any particles, scales, etc., likely to cause short circuit, may be seen and removed. When the plugs commence to bulge, they should be pressed back into the plate with a piece of flat hard wood or ebony; never use metal of any kind. Never cease the charging until the solution is milky and spray (or gas) is rising from the plates. Storage batteries are, without doubt, a coming factor in modern telephony, and their use is becoming more and more necessary, and the sooner we realize the importance of properly caring for them the more use we will find for them. Telephone men, as a rule, have not studied their accumulators as they ought to have done, and have expected too much from them. Be very careful in mixing the solution to pour in water first, five parts, then add the acid, one part. They should be kept away from metal surfaces, as the gassing will corrode them, unless they are coated with grease. It is always necessary for the successful operation of accumulators that a factor of safety be had, that is, there should be no necessity, as previously stated, for heavy charge and discharge, as this leads to the rapid deterioration of the plates.

The number and capacity of the cells should be in excess of the demand. It is absolutely necessary that all vegetable matter and sediment be avoided, and no other water should be used except distilled, thereby avoiding the possibility of trouble.

BLUE-PRINTING BY ELECTRIC LIGHT.*

BY H. G. REIST.

In large manufacturing establishments the short and frequently dark and cloudy days of winter are the occasion of great inconvenience and delay in the production of blue-prints. A printing plant suitable for making the required number of prints in summer will be entirely inadequate for the same production in winter. Unfortunately, this is a department which ordinarily cannot be worked overtime in order to make up for the loss. Suffering much on this account because of the large number of blue-prints required, the General Electric Company some time ago tried several methods of printing by electric light. In one plan a small room was arranged with nine arc lamps, placed about 18 inches apart, suspended from the ceiling, and by a suitable arrangement of

*Paper read at the Milwaukee meeting (May 28-31, 1901) of the American Society of Mechanical Engineers.

reflectors, a large portion of the light was thrown downward on printing frames arranged on trucks, being the same frames which are used ordinarily for printing by sunlight. The reflectors are hinged so that the light may be thrown to the position wanted. With a rapid printing paper the time required for printing with this arrangement is from six to eight minutes.

Another arrangement for printing, and one which is being used extensively with somewhat more satisfactory results, consists of two lamps, each being a standard 5 ampere, 110 volts inclosed arc lamp, inclosed by a metal hood a little larger in size than the printing frame. The hood is strongly constructed of sheet iron, with parabolic sides, which are finished on the inside with white enamel, having good reflecting power. The hood is supported on the lamps, and in order to prevent the parts from overheating, an effective ventilating device is provided at the top. There are also handles on the side so that it may conveniently be moved along the track. The lamps in turn are supported on a small trolley arrangement, made from the parts used for sliding folding doors, and on each side there is a conducting wire from which a small trolley wheel carries the current to the lamps. The tracks on which the lighting device is supported are of sufficient length, so that five printing frames can be set under each of them, and the lamps readily moved to cover any one of them. The printing frames which we are now using are the standard frames used for sun printing, although they can be somewhat simplified if they are made specially for printing by electric light. The lamps are inclosed in white opal globes. This diffuses the light and the white interior of the reflector projects it downward, so that the area over the print to be made is very uniformly lighted, there being no perceptible difference in the tone of the print in the middle from what it is in the corners. When the first print has been exposed a sufficient length of time, the light and the hood are moved along the track to the next frame, while work is begun on the first one to replace the printing paper or tracing as the case may be.

The time required for printing naturally varies widely with different tracings and different makes of paper. In general, it may be stated that the time required is three times or four times as long as with bright sunlight. With one grade of paper which we are using, the time by sunlight in the middle of the day during February is about thirty-five seconds, and by electric light one and one-half minutes. It will readily be seen that there are great advantages in having a printing establishment which is independent of the season or of the condition of the weather. With an electric equipment blue prints may be put into the factory almost immediately after the completion of the tracing, regardless of the time of day.

In summer it is possible to print all the time during office hours, and the per cent. of time lost on account of cloudy and rainy weather is small. In winter it is not practical to print after about 4 o'clock in the afternoon, and the amount of bad weather is a large part of the total time. In the belt in which I live it is cloudy as much as 60 per cent. of the time during the months of December and January. In cloudy weather the time required for printing is about eight times to ten times as great as on a clear day, and on a rainy day it is

not possible to print at all out of doors, except by a specially devised waterproof printing frame; but at such times the time required for changing prints is greatly increased, as the frame has to be wiped to keep from injuring the tracing.

From curves of the actinic value of sunlight for different times of the day and for different seasons, I have calculated that with a paper so rapid that it will print in eight seconds in the sun at noon during the month of July, the mean time required for making a print in January for the hours from 8 to 12 and from 1 to 4 is 2.33 minutes. Similarly, in July the mean time for the hours above, except that the time is extended to 5.30 in the afternoon, is 0.59 minutes, or the mean time for clear days during the year is 1.40 minutes.

Taking all the above into account, I find that the average number of prints made by one operator in winter per day is 26.4. In summer the number of cloudy days are about 25 per

as much as twenty minutes may be required. It will then be found an advantage to use electric light printing as a supplement to the ordinary method, even if the latter method is not entirely superseded. Among other advantages may be mentioned the smaller space required for an installation for a given output than for sun printing; also, there will be less paper wasted, as the time for printing is much more uniform.

This method of making prints will especially appeal to manufacturers who are located where there is a tendency to have fogs or where tall buildings may interfere with the normal sunlight.

English Electrical Engineers to Visit Germany.

(From our London Correspondent.)

The visit of the Institution of Electrical Engineers to Berlin commences on Saturday, June 22, when the party will leave London for



ELECTRICITY BUILDING (from a recent photograph), PAN-AMERICAN EXPOSITION.

cent., and the average number of prints that may be made by one operator are 57.3, or more than twice as many as can be made in winter.

The cost of making prints by electric light is much smaller than one would expect, and the following figures indicate that it is cheaper to use artificial light than sunlight for this purpose.

In printing by electric light it is assumed that the cost of electricity is 12 cents per kw.-hour, which, I believe, is a fair commercial rate. The lamps are turned off when not in use. They are in use only 85 minutes for each operator, as shown in the table below. Each lamp requires 550 watts, and the cost is 18.7 cents per day.

Labor is assumed at the rate of \$1 per day:

	Sunlight.	Electric light.
Number of prints per day,		
mean per year.....	41.9	56.5
Cost of printing, per print	2.39 cts.	2.09 cts.

The time required for changing a print in sunlight is a little longer than when the artificial light is used, because the whole frame has generally to be moved, and the frame has to be adjusted to the proper angle to get the most effective sunlight. The time allowed for changing prints is seven minutes when printing by electric light; eight minutes when printing by sun, while when printing during a rainy day

Hanover. On Monday, June 24, the party will proceed to Berlin, and will visit the central electricity stations and a converter station.

In the evening there will be a reception and supper offered by the Allgemeine Elektrizitäts Gesellschaft and Messrs. Siemens & Halske, to which the ladies of the party are invited. On the following day Messrs. Siemens & Halske's works and electrical museum in Charlottenburg will be visited in the morning and the Berlin new elevated electric railway in the afternoon. On Wednesday the cable works of the Allgemeine Elektrizitäts Gesellschaft and the tunnel under the river Spree will be visited and in the evening a dinner will be given to the Institution by the two firms who hitherto had entertained the members. On the following day visits will be made to various works, which will bring the official visit to Berlin to a close.

The party will be divided into three sections. The first, as we have just stated, will visit Berlin. The second and third groups will in the afternoon proceed to Dresden, where they will be received in the evening in the Gewerbehaus. On Friday morning papers will be read at a meeting of the German Elektro-Technical Society, whilst in the afternoon visits will be made to the light and power stations of the town and to the State heat-

transmission plant and electricity works. On the following day the German-Elektro-Technical Society will meet in the morning, and there will be visits to various electricity works in the afternoon and an outdoor reception in the evening. Sunday will be devoted to a visit to "Saxon Switzerland," and on Monday the third group will proceed to Nuremberg, visiting local works on Tuesday and proceeding on Wednesday to Frankfurt, where visits to works and an evening entertainment will complete the programme of the day. Thursday will be devoted to visits to central stations and installations in Frankfurt, and on Friday, July 5, there will be an excursion down the Rhine to Cologne, which will be so arranged as to permit of the members arriving in London on the morning of the following day.

High Praise for the Trade Journal.

A prominent business man, whose opinion is held in high repute, discussed the trade press with the writer recently, and his observations are interesting:

"Trade journalism," said he, "is to the trader an index, educator, informant, teacher, profit-gatherer, counsel—in short, the prized silent partner. The trade paper is an insurance against the dishonest, tricky salesman; is the champion of the trader against unjust charges or rules, whether attempted by a railway organization or an individual; it is the advocate of organization, the mouthpiece of associations; their champion and defender—therefore, worthy of the support of every one interested in co-operative effort.

"Primarily, the trade journal is for the dealer; the man so anxious to concentrate all his energy upon his business that he seeks all aids, and is willing to pay for news or information that is calculated to push him forward to success.

"The trade journal is a tool of business. If the tool is poorly tempered, of weak constitution and untidy appearance, it will exert no influence, do more harm than good; turn traders into blunderers and live a short life. If on the other hand, this tool of trade is well tempered, put together in attractive style, has force, a moral tone, and puts character first, it will live and thrive, and as it grows older exert more and more influence—secure respect for its opinion. The trade journal, then, to be a power, to have merit, to become the trader's tool, must be worth paying for. It must have individuality of its own, for in this world men count for more than method.

"By taking a trade paper you become an associate worker for your own and others' benefit, and thus carry out the highest ideals of conduct. You should ever keep in mind the old proverb, 'A man of knowledge increaseth in strength.'"

"The Thoroughfare of the Nation."

In a recent article on the growth of the traffic on the New York Central, the Rochester "Herald" says: "The New York Central may well be called the thoroughfare of the nation."

This statement was brought out by the last census, which shows that of the people living in the cities of 8,000 or more inhabitants, more than one-half live along the New York Central Lines; and of the people living in cities of 100,000 or more inhabitants, two-thirds live along the New York Central Lines.

These and other startling figures are given in No. 13 of the "Four Track Series."

Standardizing Street Railway Equipment.

The Committee on Standards of the American Street Railway Association held a meeting at Niagara Falls on the 3d inst. The object of the meeting was to map out the preliminary work of the committee. An abundance of material, which had been gathered by the secretary, was placed before the committee for consideration. It was apparent, from the data in the hands of the committee, that both street railway operators and manufacturers of street railway appliances are much interested in the work of standardizing street railway equipment. It was decided that the best results could be obtained by apportioning the work among the members of the committee, each member to act as a sub-committee on certain parts of the work assigned to him, with power to incur reasonable expense in the preparation of plans and specifications, and to report at the next meeting of the committee. The following assignments were made:

To consider two forms of rail, the "T" rail, and a grooved girder rail, each with a modified form of head; to consider two forms of wheels, one a cast chilled wheel, with either spokes or plate center, the other a steel tired wheel, with either spokes or plate center, tread and flange of wheel to conform to the rail to be recommended; to consider the wearing parts of trucks, the center-bearing swing bolster for double trucks to be recommended; to consider a standard for axles, journals, journal brasses, oil-boxes and brake-heads such as will fit the trucks of different makers—Mr. N. H. Hest, Meriden, Conn.

To consider electric motors with a view to standardizing all parts of the motor, including suspension, lead wires with connector boxes and ventilation—Mr. W. J. Hield, Minneapolis, Minn.

To consider single truck and double truck car bodies, including open cars for city and suburban service, in order to determine wherein such cars can be standardized to meet the requirements of various conditions of operation, with due regard to proper ventilation—Mr. John R. Graham, Boston, Mass.

To consider the standardizing of overhead material as far as practicable along the following lines: trolley wire, trolley wheels, trolley ears, trolley hangers, span wires, pull-off wires, section insulators, cut-outs, overhead frogs and switches, lightning arresters and all parts that go to make up the overhead system—Mr. C. F. Holmes, Kansas City, Mo.

Mr. T. E. Crossman, 1829 Park Row Building, New York, is secretary of the committee, and he will be glad, on behalf of the committee, to receive any communications bearing on the above-named subjects from any interested persons.

Bell Telephone Business Bad.

Gen. John I. Sabin, recently chosen president of the Central Union Telephone Company of Chicago, has shocked the telephone world by the extremely unconventional circular letter addressed by him to the stockholders in which he bluntly states some unpalatable truths and vigorously urges heroic remedies.

He finds it imperative that \$5,000,000 new capital be immediately provided and suggests three plans: An assessment of \$60 in three installments; a 4 per cent. loan of the same amount to the company by stockholders; pur-

chase by stockholders of the \$3,000,000 capital stock.

In stating the need for some such measure, Gen. Sabin says: "There is no use crying over spilled milk, or abusing one another for things not accomplished. Illinois, Indiana, Ohio and Iowa want telephone service. Will you supply it, or must some one else?"

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended June 5:

Antwerp, 8 packages, \$833; Argentine Republic, 106 packages, \$4,302; Australia, 237 packages, \$11,682; Brazil, 156 packages, \$1,921; Bremen, 4 packages, \$154; British East Indies, 1 case, \$20; British West Indies, 34 packages, \$617; Central America, 41 cases, \$1,201; Chili, 9 cases, \$275; Cuba, 11 cases, \$701; Dublin, 3 packages, \$90; Dutch East Indies, 1 package, \$21; Glasgow, 75 packages, \$6,385; Halifax, 10 cases, \$476; Hamburg, 31 packages, \$1,181; Havre, 49 packages, \$2,628; Hull, 2 cases, \$163; Japan, 170 cases, \$14,056; 4 packages, \$4,597; Korea, 3 cases, \$73; Liverpool, 204 packages, \$7,199; London, 135 packages, \$11,359; Manchester, 5 packages, \$190; 3 cases, \$637; Mexico, 118 cases, \$5,293; New Foundland, 14 cases, \$400; New Zealand, 6 packages, \$120; Nova Scotia, 2 cases, \$21; 8 packages, \$1,042; Peru, 8 packages, \$436; U. S. Colombia, 27 packages, \$916; Venezuela, 1 package, \$16; Vienna, 4 packages, \$300; Waereghon, 84 cases, \$1,764.

The following are the exports of electrical material, from the port of New York, for the week ended June 12.

Antwerp, 16 packages, \$894; Argentine Republic, 99 cases, \$2,388; Australia, 73 cases, \$13,452; 8 motors, \$250; 6 motor vehicles, \$5,000; Barcelona, 12 packages, \$426; Berlin, 40 cases, \$380; Bilbao, 2 cases, \$100; Brazil, 35 cases, \$982; 14 cases motors and parts, \$180; Bremen, 4 packages, \$120; British Guiana, 18 packages, \$410; British East Indies, 1,633 packages, \$253,914; British West Indies, 3 packages, \$138; Canary Islands, 1 package, \$5; Central America, 3 packages, \$62; Copenhagen, 2 packages, \$30; Cuba, 174 cases, \$5,985; Dundee, 1 package, \$30; Dutch West Indies, 4 packages, \$41; Ecuador, 115 packages, \$903; Genoa, 14 packages, \$926; Gijon, 9 cases, \$1,622; Glasgow, 4 packages, \$575; Hamburg, 31 packages, \$1,277; Havre, 137 packages, \$17,162; Japan, 18 packages, \$650; Libau, 2 packages, \$21; Lisbon, 1 package, \$30; Liverpool, 927 packages, \$9,357; London, 580 packages, \$34,551; Marseilles, 25 packages, \$300; Mexico, 93 packages, \$2,175; Milan, 8 cases, \$1,164; Moscow, 15 packages, \$1,791; Palermo, 1 package, \$9; Peru, 4 cases, \$210; Riga, 6 packages, \$600; Southampton, 11 cases, \$258; 10 packages, \$1,030; Stockholm, 1 case, \$17; St. Petersburg, 2 cases, \$257; St. Helena, 3 packages, \$190; Uruguay, 1 package motor carriage, \$290; U. S. Colombia, 4 packages, \$113; Venezuela, 91 packages, \$1,696.

PERSONAL MENTION.

Mr. D. Le Roy Dresser was recently elected president of the Merchants' Association of New York.

Mr. John Waring, president of the Franklin Electric Company of Hartford, Conn., who was burned in the explosion of gasoline at the company's experimental room, died last week at the Hartford Hospital. He was a talented electrical engineer and invented several electrical devices.

INCORPORATIONS.

The Vulcan Electric Light, Heat & Power Company, Trenton, N. J. Capital stock, \$10,000.

The Wheeler Green Electric Company, Rochester, N. Y. Capital stock, \$4,000. Directors: W. J. Dadee, Clarence Wheeler and T. H. Green, all of Rochester.

The Mountain Water & Electric Company, Stockton, Cal. Capital stock, \$25,000. Incorporators: J. U. Castle, L. A. Richards and J. P. Spooner.

The People's Gas, Electric & Heating Company, Bloomington, Ind. Capital stock, \$10,000. Incorporators: A. M. Barron, F. B. Sherman and others.

The Standard Electric Distributing Company, San Francisco, Cal. Capital stock, \$5,000,000. Directors: R. J. Davis, J. M. O'Brien, T. E. Ryan, C. H. Pennoyer and J. E. Green.

The International Electric Syndicate of New York, Dover, Del.—to manufacture lyddite, giant powder and other high explosives. Capital stock, \$500,000.

The Tuckerton Electric Company, Camden, N. J. Capital stock, \$10,000. Incorporators: Ezra A. and John H. Bell and Edwin Pharo of Haddonfield, N. J.

The Scientific & Electrical Exchange, New York City. Capital stock, \$25,000. Directors: W. F. Thompson of New York City, A. E. Hartcorn of Brooklyn, F. S. Cutler and W. D. W. Miller of Plainfield, N. J.

The Postal Telegraph Cable Company of New Jersey, Jersey City, N. J.—to build, own and operate a line wholly within the State of New Jersey. Capital stock, \$50,000. Incorporators: William H. Baker, Charles P. Bruch and Theodore L. Cuyler, Jr.

The New Jersey Power Storage Company, Trenton, N. J.—to purchase, sell and distribute power of all kinds by electrical, pneumatic, mechanical, hydraulic and other means of transmission, and to apply such power to the transportation of passengers and merchandise, and for such other useful purposes. Capital stock, \$100,000.

COMMERCIAL PARAGRAPHS.

The number of telephone exchanges throughout the country that are being equipped with the Stromberg-Carlson Central Energy System certainly speaks well for the telephone apparatus turned out by this well-known concern. The company has been constantly enlarging its plant and only recently purchased the land and seven-story building at Clinton street and Jackson boulevard, Chicago, for \$212,000. Information regarding the Stromberg-Carlson Mfg. Company's apparatus may be obtained by addressing a letter to 70-82 W. Jackson boulevard, Chicago.

Persons contemplating building a telephone exchange would do well to communicate with the Independent Telephone Construction Company, 85 Dearborn street, Chicago. This popular concern will furnish plans and specifications for any kind of telephone construction and stands ready to build and equip exchanges with any make of apparatus desired.

Messrs. E. M. Van Duzee, Jr., & Co., Fifth and Jackson streets, St. Paul, Minn. (Minneapolis office 830 Guaranty Building), announce that they have recently completed arrangements with the Haines & Noyes Company, manufacturers of Guaranteed Telephone Apparatus, to represent them exclusively as their agents for the State of Minnesota. They inform us that they will be in position to sell to the trade as well as to the consumer, and that the prices will be identical with those of the Haines & Noyes Company.

We have been informed by the Ericsson Telephone Company, 296 Broadway, New York City, that the Ericsson telephone was awarded first prize at Paris, 1881; Madrid, 1883; Vienna, 1884; Stockholm, 1886; Copenhagen, 1888, and Chicago, 1893. Also that its exhibit in Paris in 1900 was from the St. Petersburg, Russia, factory, which was also awarded first prize. This year its exhibit of a fifty-subscriber switchboard and a few of its different telephones at the Pan-American Exposition at Buffalo is made in Section S of the Electricity Building and Mr. W. Jac Marland will have charge of the exhibit. The Ericsson Company extends

to all its friends and patrons a cordial invitation to see its exhibit and talk over its instruments. It is exhibiting its goods in connection with others in a collective electrical exhibit, which will doubtless prove of interest to many of our readers.

The American Toll Telephone Company, 43-47 Sheriff street, Cleveland, O., has lately added to its already complete line of pay stations a new call register for measured service. The Bell Companies have for years considered this part of their service very profitable to them and these small instruments are in use in very large numbers. As yet the Independent field has not had access to an instrument of this kind, but the above company has already taken large orders for its machines.



It is built on different lines than the register used by the Bell Companies and cannot be manipulated in any way, and it is impossible to obtain signals by rapping the box on the side. Many telephone companies are now advertising measured service at the rate of 600 calls for 3 cents per call—all over and above that at 5 cents per call. This call register notifies operator, also keeps an accurate account of all outgoing calls, thus saving all disputes between subscriber and central, as the register is in plain view of the subscriber. This part of the telephone service is one that may be investigated by the Independent Companies with much profit to themselves and satisfaction to patrons. The instruments are sold at a very reasonable figure and can easily be attached to any telephone.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED JUNE 11, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

676,085. System of Electric Propulsion. Henry Halberstadt, Kenosha, Wis. Filed Jan. 26, 1900.

676,108. Electric-Railway System. George Westinghouse, Jr., Pittsburgh, Pa., assignor to the Westinghouse Electric & Manufacturing Company, same place. Filed June 21, 1890.

676,190. Racing Trolley-Track. Charles W. Hutchinson, New York City. Filed March 16, 1901.

676,378. Safety Trolley-Base. Andrew C. Wolfe, Denver, Col., assignor of two-thirds to Charles K. Wolfe and Frank Dillingham, same place, and Joseph F. Hewitt, Allegheny, Pa. Filed Jan. 22, 1901.

ELECTRIC LIGHTS AND APPLIANCES.

676,068. Incandescent Electric Lamp. Levi Lobenthal, New York City, assignor of one half to Thomas E. McIver, same place. Filed Oct. 11, 1900.

676,069. Incandescent Electric Lamp. Levi Lobenthal, New York City, assignor of eleven-twentieths to Thomas E. McIver, same place, and John McCullough, Newark, N. J. Filed April 1, 1901.

676,074. Incandescent Electric Lamp. John McCullough, Newark, N. J., assignor of three-fourths to Thomas E. McIver, Michael Lobenthal and Levi Lobenthal, New York City. Filed April 2, 1901.

676,202. Incandescent-Lamp Socket. Walter H. Perkins, Waterbury, Conn., assignor to the Waterbury Mfg. Co., same place. Filed April 9, 1901.

676,289. Switch for Electric Lamps. Charles Wagner, New York City, assignor to Edward F. Caldwell & Co., same place. Filed Feb. 28, 1901.

676,377. Elastic Support for Arc Lamps. Fredrick Wilkie,

New York City, assignor to the Manhattan General Construction Company, Newark, N. J. Filed Sept. 5, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

675,931. Electric Meter. Luigi G. Cauro, Naples, Italy. Filed Dec. 31, 1897.

675,996. Electric Meter. Ludwig Gutmann, Peoria, Ill. Filed June 6, 1900.

676,267. Transformer. Walter S. Moody, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Feb. 23, 1901.

676,280. Electric Switch. Eduard Schulz, Barmen, Germany. Filed Nov. 20, 1900.

676,298. Brush-Holder. Asa F. Batchelder, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Feb. 28, 1901.

676,305. System of Motor Control. Albert G. Davis, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed March 5, 1900.

676,308. Brush-Holder. Henry Gelsenhoner, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed Feb. 20, 1901.

676,344. Regulating Device for Alternating-Current Circuits. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company of New York. Filed Jan. 29, 1900.

MISCELLANEOUS.

675,978. Electrograph. Michael Beck, Minneapolis, Minn. Filed Aug. 8, 1899.

675,894-675,895. Printing-Telegraph. Freeman H. Littlefield, St. Louis, Mo., assignor of two-thirds to Mordecai Yarnall and J. O. Chenoweth, same place. Filed June 18, 1900, Feb. 23, 1901.

675,918. Storage Battery. Vincent G. Apple, Dayton, O., assignor to the Dayton Electrical Manufacturing Company, same place. Filed Nov. 1, 1900.

675,995. Method of Producing Phase Compensation. Ludwig Gutmann, Peoria, Ill. Filed Jan. 28, 1901.

676,006. Reception and Retransmission of Electrical Impulses. Alexander Muirhead, Shortlands, Eng. Filed Feb. 20, 1901.

676,065. Automatic Electric Fire-Alarm. Willis J. Brewster, Port Ewen, N. Y., assignor to Emily E. Brewster, Esopus, N. Y. Filed Aug. 4, 1900.

676,091. Printing Telegraph Transmitting Apparatus. Kirk Himrod, Chicago, and John R. Tucker and Charles C. Hinckley, Aurora, Ill., assignors to the International Typal Telegraph Company, Detroit, Mich. Filed March 10, 1899.

676,092. Railroad Signal Apparatus. John K. Hoddinott, Baltimore, Md. Filed April 30, 1900.

676,093. Electrical Contact-Making Device. Preston R. Pappin, St. Louis, Mo. Filed Sept. 24, 1900.

676,099. Electric Igniter for Explosive-Engines. John V. Rice, Jr., Edgewater Park, N. J., assignor to the John V. Rice, Junior, Company, same place. Filed Aug. 12, 1897. Renewed Nov. 3, 1900.

676,105. Protecting Device for Coils of Electrical Apparatus. Percy H. Thomas, Pittsburgh, Pa., assignor to the Westinghouse Electric & Manufacturing Company of Pennsylvania. Filed Nov. 9, 1900.

676,103. Sound-Recording Apparatus. Louis P. Valquet, New York City, assignor to the Universal Talking Machine Company, same place. Filed June 8, 1899.

676,187. Printing Telegraph Receiver. John M. Joy, New York City, assignor to the Printing Telegraph News Company, same place. Filed Sept. 20, 1900.

676,166. Regulating Roentgen-Ray Tubes. Harry F. Walte, New York City. Filed March 23, 1901.

676,185. Lightning-Protector for Electrical Apparatus. Franz Gatteringer, Vienna, Austria Hungary. Filed March 28, 1896.

676,263. Automobile. Isidor Kitzee, Philadelphia, Pa. Filed March 29, 1901.

676,281. Electrode for Primary Batteries. William T. Seddon, Philadelphia, Pa., assignor to Herman J. Dercum, trustee, same place. Filed Dec. 17, 1900.

676,300. System of Electrical Distribution. Ernst J. Berg, Schenectady, N. Y., assignor to the General Electric Company of New York. Filed March 9, 1900.

676,311. Mechanism for Controlling and Indicating Temperature Limits. Ernest H. Griffiths and William C. D. Whetham, Cambridge, Eng. Filed Dec. 19, 1900.

676,332. Apparatus for Wireless Telegraphy. Guglielmo Marconi, London, Eng., assignor to Marconi's Wireless Telegraph Company, Limited, same place. Filed Feb. 23, 1901.

676,333. Apparatus for Making Electrodes. George J. Miller, Kenton, O. Filed Feb. 5, 1900.

676,339. System of Distribution. Horace F. Parshall, London, Eng., assignor to the General Electric Company of New York. Filed Jan. 23, 1901.

676,346. Electric-Clock Signal. Harry B. Vaughan, Little Rock, Ark. Filed Jan. 31, 1901.

676,365. Means for Electrically Lighting Lightships or Other Stationary Vessels. Jurgen H. Junge, Cuxhaven, Germany. Filed June 28, 1900.

THE TELEPHONE WORLD.

New Telephone Line in California.

The Sunset Telephone Company has started work on a new line from Stockton to Fresno alongside of the Santa Fe Railroad track. The wire to be used will be the first of its kind put up in California. It will be an aluminum cable of seven strands, or separate wires, and it will be possible to handle a large amount of business over it every day.

While there has been a telephone line to Los Angeles for years it is by way of what is known as the coast route, or from San Francisco to Santa Barbara and then into the Angel City. The telephone company proposes to have a direct system between Stockton and Los Angeles through the center of the San Joaquin Valley. It has just completed a new line from San Diego, through Los Angeles to Bakersfield and repaired the system between the latter town and Fresno. By constructing a new line from Stockton to Fresno a direct system will be opened.

For several weeks the Santa Fe has been distributing large masts along its road between the raisin center and Stockton at odd times, and has just finished putting out the last of the poles. A large force of men is working a few miles south of Stockton. It is expected that the new system will be in operation by the end of June, though it may take longer to finish it. This new aluminum wire is said to be the best made, as conversation over it is much more distinct than the old copper wire.

After the new system is opened the telephone company will extend the line from Stockton west to Point Richmond along the Santa Fe, a distance of 75 miles, and thence across the bay into San Francisco.

New Telephone Attachment.

Letters of patent have been asked for by I. O. Persons, of Dublin, Ga., on a telephone attachment, which will do away with the necessity of ringing the central office when one desires connection over the telephone, nothing being required but to lift the receiver from the hook and tell the operator at the exchange what number is wanted. Mr. Clark Grier, manager in Dublin for the Southern Bell Telephone Company, has purchased an interest in the invention. All familiar with telephones who have seen the attachment at work are said to be satisfied with its practicability. Mr. Persons, who is the superintendent for the Dublin Telephone Company, has invented several telephone appliances.

Messrs. Boynton & Earl of Waco, Tex., were in Fort Worth a short time ago in the interest of a franchise for a telephone company to be known as the Lone Star Company. They met a number of citizens and J. E. Boynton presented the matter. He said that the company he represented was organized at Waco, and that it was operating a successful exchange there, as well as at other points in the State, including San Antonio, with over 1,800 phones; Houston, with 1,400; Corsicana, with between 400 and 500, and that the company was arranging for exchanges at Austin, Belton, Temple, Taylor, Waxahachie, Cleburne, Hillsboro, Denison, Sherman and other points in the State, and also that the company in operating its long-distance lines had fixed a rate of 15 cents for two minutes for twenty miles. He stated that the company would expend \$200,000 in improvements in Fort Worth if the city council would grant the franchise desired.

The Avondale, Ga., rifle range is to be equipped with a new telephone system. The contract for the work was given recently. The system will cost \$175, and when completed will admit of communication with the markers in the pits in a much more satisfactory manner than is now possible with the old telephone or the megaphone. With the perfection of the new telephone system, there will be absolutely nothing else to be desired for the range.

The Home Telephone Company of Louisville, Ky., has purchased property costing \$15,000, and will shortly begin the erection of one of the most modern telephone exchanges in the United States. When complete it will cost \$50,000 or over.

At the annual meeting of the stockholders of the telephone company of Daytona, Fla., held recently, it was voted to increase the capital stock and build a line to De Land to connect with the Jacksonville and Tampa long distance line.

W. D. Medearis of Fayetteville, Tenn., has lately been in Sewanee establishing an exchange for the Cumberland Telephone Company, which is near completion. Iliff Conger is manager.

The Piqua, O., Home Telephone Company has increased its capital stock from \$75,000 to \$100,000.

The Galesburg, Ill., Union Telephone Company has certified that it has increased its directors from five to eleven.

Russia to Study American Telephone Systems.

With the view of the early adoption of an improved municipal telephone service, the local authorities of St. Petersburg are about to dispatch an engineer to make a comprehensive study of American systems. Russia has long been jealous of the commanding position held by Sweden in the field of telephones, and her technical authorities point out that the United States is the only country in the world in advance of Scandinavian ideas in telephone matters.

The Home Telephone Company of Trenton, N. J., has practically changed hands. The majority of the bonds has been purchased by Hugh H. Hamill, president of the Trenton Trust & Safe Deposit Company. The name of the parties Mr. Hamill represents has not yet been made known. By Mr. Hamill's purchase, the parties he represents are now practically in control of the Home plant. The bonds acted as a mortgage on the stock and as the stockholders allowed them to mature without meeting the interest the bondholders have the right to foreclose. The Morton Trust Company of New York, which acts as trustee of the bondholders, began the preliminary proceedings some time ago, but under instructions from the bondholders it delayed action, pending a settlement of the company's affairs. If the promoters secure the remainder of the bonds they will have a mortgage on the entire stock, and in this event its purchase will follow, as the stockholders are very anxious to sell.

News from Washington, D. C., states that Walter C. Allen, the electrical engineer, recently requested that the Chesapeake & Potomac Telephone Company be asked to give the District the benefit of the reduction in rates for extra equipment used in connection with the exchange telephones in the various offices of the District Government. After some correspondence between the commissioners and the company the reduction in the rates of equipment has been arranged.

The Michigan Telephone Company of Detroit has discontinued compelling use of nickel-in-the-slot telephones and calls are now answered from central in the old manner without the necessity of putting up five cents. The company claims it put the system in to help out the druggists and that it has never paid. It is now optional with the druggists whether they keep up the slot arrangement or not.

The Remsen, N. Y., & West Canada Telephone Company has purchased of the Central New York Telephone & Telegraph Company its line from Hinchley to Trenton, N. Y. Later the line will be extended to Piseco Lake.

The telephone line leading from Loudon to Morgantown, Tenn., has been completed to Birton's Mill, eight miles distant, and the phones are now ready to be put in. When completed this will give two lines to Morgantown. One by the way of Knoxville and one almost on a direct line through Piney.

An independent telephone company, backed by Denver capitalists, will establish a telephone system in Cheyenne, Wyo., at once, providing the city council will grant a charter. Phones in residences will cost about \$1 per month, and business houses will be assessed about \$2 per month.

A new and complete system of Bell telephones will soon be in operation at Austell, Ga., connecting that city with Atlanta, in addition to Mableton, Lithia and other local stations. B. H. Veal is president of the company and R. B. Cloud is secretary, and the enterprise gives promise of being successful.

The Northwestern Telephone & Telegraph Company is extending its lines to Cranberry Lake, N. Y., and expects to have them in operation in a few weeks.

The Twin City Telephone Company of Minneapolis, Minn., filed an amendment to its articles of incorporation fixing its debt limit at \$1,000,000.

The Sidney, O., Telephone Company has increased its capital stock from \$40,000 to \$60,000.

A telephone line is to be constructed between Altoona and Wisner, Neb.

The Iron Range Electric Telephone Company of Minneapolis, Minn., has increased its capital stock from \$50,000 to \$75,000.

The Collinwood, O., Home Telephone Company, lately increased its capital stock from \$25,000 to \$50,000.

Telephones for Trolleys.

The Worcester, Mass., Consolidated Street Railway Company will equip all its suburban lines with private telephone systems. This is the most effective means used by suburban street railway companies to run cars on a single track line in safety without occasional long waits at the turnouts. The contract has been let to the New England Telephone & Telegraph Company to install the system and linemen are at work putting up the telephones and stringing the wires. The lines to be equipped are the Fitchburg division, the Spencer and the Millbury lines. The only other suburban lines operated by the Consolidated, the Worcester & Marlboro and the Grafton lines, have had telephones from the start.

Wisconsin has telephone service by mutual companies doing business in many cities under what is called the "Wisconsin valley plan." It is strictly co-operative. Stock can be bought only by persons that rent telephones, and such persons can buy as many shares of stock as they rent telephones, and no more. Whenever the stockholder ceases to rent as many telephones as he holds shares, the company has a right to cancel his excess and refund to him its par value. The company binds itself to furnish stock to every renter of its service. It must also regulate its monthly charges so as to be able to pay a dividend of 1 per cent. a month, to be credited to the monthly renter. In Grand Rapids a rental of \$2.25 a month for business houses and \$1 for residences is charged, and a monthly dividend of 1½ per cent. (75 cents) is credited on the rental account of each stockholder, so the stockholder actually gets his business telephone for \$1.50 and his dwelling telephone for 25 cents a month.

The council of Starke, Fla., has granted to M. G. Rowe of Madison an exclusive franchise for twenty years for the construction and operation of a local telephone exchange in Starke. Mr. Rowe says he will begin work on or by July 1, and will have the system in good working order as possible, probably by September 1, and not later than October 1.

Newton, Tex., is soon to have telephone connection with the outside world. J. M. Smith of Beaumont made a proposition to build his line into Newton from Roganville, if the people would put up a small bonus, which they have done.

The telephone line from Roan's Prairie to Singleton, Tex., both towns in Grimes County, has just been completed, and work will shortly begin on to Bedias and finally to Madisonville in Madison County.

The Zenith Telephone Company has leased ground on Avenue "A" in Cloquet, Minn., and will at once erect a building for a central telephone station.

The Alabama & Georgia Long Distance Telephone Company has improved the line between Gadsden and Birmingham. The entire line has been repaired.

The Elmira, N. Y., Telephone Company has filed with the Secretary of State a certificate of increase of capital stock from \$40,000 to \$150,000.

The Troy, O., Telephone Company, has increased its capital stock from \$40,000 to \$75,000.

TELEPHONE INCORPORATIONS.

The Fulda Telephone Company, Fulda, Minn. Capital stock, \$25,000.

The Napoleon Home Telephone Company, Napoleon, O. Capital stock, \$50,000.

The Jo Davies County Mutual Telephone Company, Elizabeth, Ill. Capital stock, \$2,500. Incorporators: William Skine, Ernest Stadel and Rudolph Dittmer.

The Wharton Valley Telephone Company, South Edmeston, N. Y. Capital stock, \$3,000. Directors: B. F. Bishop, Garrattsville; Van Ness D. Robinson, Edmeston; Frank Harrington, West Burlington.

The Farmers' Mutual Telephone Company, Elkhart, Ind. Capital stock, \$5,000. Directors: J. J. Zollinger, R. W. Davenport, C. R. Myers, J. R. Cripe, Harvey Myers and A. J. Yades.

The Citizens' Telephone Company, Brazil, Ind. Capital stock, \$10,000. Directors: Theodore W. Englehart, H. D. Talk, M. J. Murphy, C. J. McCullough, Oscar Houk and John G. H. Klingler.

The Frontier County Telephone Company, Stockville, Neb. —to run a line from Stockville to Curtis at once. Capital stock, \$2,000. Incorporators: A. J. Clifton, E. S. Case, M. T. Ward, J. H. Bayston, D. C. Dye, Eugene Link and Charles Riggs.

GENERAL ELECTRICAL NEWS.

Lighting.

Arkadelphia, Ark.—J. W. Wilson, instead of J. W. Urlson, has purchased the plant of the Arkadelphia Light & Water Company, and will install two dynamos, and not five as stated in the issue of June 5.

Ashpole, N. C.—This town will probably construct a system of electric lights. Dr. J. P. Brown, mayor.

Auburn, Neb.—A movement is on foot to organize a local company to construct and operate an electric light plant here.

Augusta, Ga.—The North Augusta Electric & Improvement Company was lately chartered with \$1,500,000, capital stock with J. U. Jackson, president, and F. M. Jackson, secretary.

Beloit, Kan.—The electric light plant owned by A. T. Rodgers in this city is to be enlarged.

Brookfield, Mo.—H. H. Stephens of Macomb, Ill., will obtain a franchise for an electric light plant here.

Chillicothe, Mo.—This city has voted \$20,000 for an electric light plant.

Cleveland, Tenn.—A company has purchased the Cleveland Water & Electric Light Company's plant, and will change the location of and improve the same.

Cumberland, Md.—This city will probably increase its electric light plant capacity.

East Liverpool, O.—The Wellsville Electric Light Company has increased its capital stock from \$30,000 to \$100,000.

Flora, Ill.—The city council has decided to double the capacity of the municipal electric light plant in this city.

Fortville, Ind.—J. K. Fatout of Indianapolis, and Q. A. Wright of this place, have secured a franchise for an electric light and waterworks plant, the same to be erected at once.

Gilman, Ill.—A. S. Grenier of the electric light plant is working out a plan to extend the scope of the plant to take in Danforth Ashkum and Clifton. His plan contemplates the furnishing of electricity for both street and commercial lighting.

Groton, Vt.—A. H. Bailey of Wells River is interested in the establishing of an electric light plant in this village.

Kenosha, Wis.—The Kenosha Gas & Electric Company is again figuring on the erection of a new power house in this city.

Mahanoy City, Pa.—The Mahanoy City Electric Light Company will enlarge its plant.

Manning, Ia.—Messrs. Sweeny & Ort have organized a stock company to put in an electric lighting plant here.

Mayville, Mich.—At a recent special election it was voted to bond the village for \$5,000 to purchase a municipal electric lighting plant.

Media, Pa.—At a recent meeting of the Media borough council, the light committee, Messrs. Dr. E. M. Harvey, Samuel A. Field and William H. Hardcastle with W. S. Worrell, were appointed a special committee having in view the establishment of a permanent electric light plant to be operated by the borough.

Mullica Hill, N. J.—An option has been secured on the old mill property for an electric light plant. The Mullica Hill Improvement Association can be addressed.

Nashville, Tenn.—T. J. Mooney & Co. have been awarded the contract for equipping the city electric light plant at \$32,000.

Niobrara, Neb.—The Electric Light Company has sold out the plant to Randa & Gruenberg, who will enlarge and improve it.

Omaha, Neb.—All bids for the construction and installation of the city electric lighting plant, for which \$55,000 of bonds were recently voted, were rejected by the council because they did not conform to necessary requirements. New bids will be opened in July.

Oneida, Ill.—Oneida is discussing the advisability of putting in an electric light plant.

Paris, Mo.—The citizens have voted to issue \$20,000 in bonds for the erection of an electric light plant and waterworks.

Rockville, Md.—The town council is considering the erection of a new electric power-house to replace the

one recently destroyed by fire. Such a plant as has been suggested would cost about \$10,000, and it is proposed to borrow the money on the notes of the citizens of the town.

San Jose, Cal.—San Jose is figuring on a \$75,000 electric lighting plant.

Somerset, Ky.—Articles of incorporation were recently filed by the Electric Light & Power Company with \$10,000 capital stock.

St. Clairsville, O.—An election is to be held to vote on the question of issuing bonds to repair the electric light plant.

Unionville, Conn.—The Unionville Electric Light & Power Company of this place has been incorporated for \$20,000, and will proceed at once to erect an electric light plant here for the lighting of the entire town of Farmington.

Warren, O.—A movement is on foot to establish a fourth electric light plant here. Warren capital is interested and a site is already under consideration. The plant will employ 100 men at the start.

Windfall, Ind.—A movement has been started to erect an electric light plant at this place.

Windsor, N. C.—R. C. Bazemore and associates will build an electric light plant.

Wyandotte, Mich.—There is talk of raising the price of electric light in this place so that the lighting plant may become self-supporting.

Street Railways.

Bordentown, N. J.—The Camden & Trenton Railway Company will furnish an electric sprinkler to lay the dust on the streets of this town during the coming summer.

Canajoharie, N. Y.—It is reported on good authority that a company will shortly be incorporated to build an electric line from Fort Plain to this place, thence to Sharon Springs.

Cardington, O.—The Marsfield, Cardington & Delaware Electric Railroad Company has been incorporated with A. A. Whitney president.

Carlisle, Pa.—Carlisle capitalists have organized the Star Traction Company with Jacob Foreman as president. It will build and operate a trolley line from this place to York by a route 20 miles in length.

Cleveland, O.—Announcement is made of the purchase by the Everett-Moore syndicate of all the street railway lines of Toledo, and other negotiations in progress, when completed, will give the syndicate control of all electric railways between Detroit and this city. Every electric railway in Northern Ohio and Southern Michigan will also be merged, with the exception of the Fomeroy interests, and the Little Consolidated Street Railway of Cleveland.

Clyde, O.—At a special meeting of the city council a franchise was granted the Sandusky, Clyde & Tiffin Electric Railway, which the promoters propose to build from Sandusky to Tiffin.

Delaware, O.—The Columbus, Delaware & Northern Electric Railway Company has purchased the Stratford paper mill, and will construct a \$90,000 power house.

Des Moines, Ia.—The Des Moines, Nevada & Eldora Electric Railway Company has been incorporated for \$50,000 by H. H. Polk, president, and S. Cassidy, treasurer.

Eau Claire, Wis.—A. H. Appleyard, owner of the Dayton, Springfield & Urbana, and two other electric roads in Ohio, and of the Eau Claire and Chippewa Falls lines, recently arrived in this city with Engineer, Alderman and Superintendent Hardigan for the purpose of making surveys and incorporating a company for an electric road between this city and St. Paul via Menomonie, Hudson and Stillwater, and work of construction will begin at once.

Galion, O.—This city will have two electric railways. The Ohio Central Traction Railway, which has been in operation between here and Bucyrus, will extend its lines to Crestline five miles north. The Mansfield, Crestline & Galion Railway has secured a franchise between the two cities and proposes to build a line

which will be part of the link to connect Cleveland and Columbus by an electric road.

Glen Jean, W. Va.—It is stated that Fayette County will probably vote in favor of subscribing \$50,000 to the stock of the company which proposed building an electric railroad between Fayette Station and this place. A. D. Preston, of Fayetteville, is one of the principal promoters of the line.

Milford, N. H.—Franklin Marden, president of the Mount Vernon & Milford Electric Railroad Company, is trying to arouse public interest in the building of the line which means so much for this section. Mr. Marden says if \$20,000 can be pledged in the towns of Milford, Amherst and Mount Vernon, he will guarantee the other \$30,000, which will make the capital stock complete.

Pontiac, Mich.—Messrs. J. Dean, O. Price and J. T. Morehouse, promoters of the proposed Detroit & Bay City electric road running by way of Pontiac, Lapeer and Caro have asked the Pontiac council for a franchise.

Sedalia, Mo.—The Railway & Electric Company of Sedalia has been incorporated for \$250,000 by W. B. Broomall, C. A. Duhring and L. Davis.

Toledo, O.—The Toledo, Fremont & Norwalk Electric Railway Company will build a branch to Gibsonburg.

Upper Sandusky, O.—Hon. M. A. Smalley and others are securing the right of way for an electric railway from Marion to Findlay through this city.

Manufacturing.

Dallas, Tex.—The Sutton-Steele Electrical Mining & Milling Company of this city, with a capital stock of \$100,000, has been incorporated to manufacture and sell such tools, machines and implements as are necessary to carry on a mining and milling business. H. M. Sutton, I. Jalonick, E. G. Steele and S. Leake are the promoters.

New York City.—The Automatic Bootblacking Machine Company of this city was incorporated a short time ago with a capital of \$2,000. The company proposes to manufacture machines for blacking boots by electricity. Ignatz Boskowitz, Albert Ulmann and Edward Mauelsdorf are all interested in the concern.

Company Matters.

Birmingham, Ala.—A deal consolidating the Birmingham Railway, Light & Power Company, the Consolidated Electric Light Company and the Birmingham Gas Company, arranged by Isidore Newman, of New Orleans; Harry M. Atkinson, of Atlanta, and the Old Colony Trust Company of Boston, was completed last week. The new corporation will have a capital of \$10,000,000.

San Gabriel, Cal.—The San Gabriel Electric Company has decided to increase its capital stock from \$500,000 to \$1,000,000.

Power and Transmission.

Appleton, Wis.—Mill Architect C. B. Pride, in company with a number of Chicago and Eastern capitalists, recently returned from the vicinity of Iron Mountain, Mich., where, it is stated, some deals are pending for the transmission of electricity from nearby water powers. It is understood that surveys of the water powers have already been partially completed, and that the deal involves the furnishing of light, heat and power to a number of towns and villages on the Menominee River in the neighborhood of Florence.

Automobiles.

New York City.—The firm of Palmer & Olson of this city has been organized to deal in electric vehicles and machinery with a capital of \$20,000. C. A. Olson and H. B. Palmer, New York City, and C. E. Francis, Brooklyn, are the parties interested.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by **ELECTRICITY** from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mfg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Authoriz'd	Issued.					Authoriz'd	Issued.				
Albany, N. Y.—June 17						Hartford Conn.—June 17					
United Traction.....	100	\$5,000,000	\$5,000,000	1 1/4 % Q.	106	108	Hartford Street Ry. Co.....	100	\$4,000,000	\$200,000	8 % S., Oct.,
(Consolidation of the Albany and Troy City Railway.)							Hartford & West Hartford.....	100	1,000,000	247,000	—
Allentown Pa.—June 17						Holyoke Mass.—June 17					
Allentown & Lehigh Val. Trac. Co.	—	4,000,000	1,500,000	—	—	15	Holyoke Street Ry. Co.....	100	400,000	400,000	8 % A., June,
Bridgeport, Conn.—June 17:							Hoboken N. J.—June 17				207 1/2
Bridgeport Traction Co.....	100	2,000,000	2,000,000	1 % Aug.	100	—	North Hudson Co. (N. J.) Ry. Co..	25	1,250,000	1,000,000	8 %
Baltimore Md.—June 17							Indianapolis, Ind.—June 17				180
United Railways & Elec. Co.....com	50	24,000,000	18,000,000	—	16	16 1/4	Indianapolis Street Ry.....	—	5,000,000	5,000,000	—
Boston, Mass.—June 17							Lancaster, Pa.—June 17				25
New England Street Ry.....	25	5,000,000	1,081,925	1 % Q., Jan. 15,	—	—	Pennsylvania Traction Co.....	100	10,000,000	9,900,000	—
North Shore Traction Co.....com.	100	4,000,000	4,000,000	—	15	16	Lancaster & Col. Electric Ry.....	—	—	87,500	—
North Shore Traction Co.....pfd.	100	2,000,000	2,000,000	6 % S. A. & O.	85	87	West End Street Railway.....	—	—	—	—
West End Street Ry. Co.....com.	50	10,000,000	—	8 % S., Oct.,	95	95 1/2	Louisville, Ky.—June 17:				
West End Street Ry. Co.....8 % pfd.	50	4,400,000	6,400,000	4 % S., Jan.	114	115	Louisville Ry.....com	100	4,000,000	8,500,000	1 1/4 %
Boston Elevated R. R.....	100	10,000,000	—	2 1/4 % Aug. 99,	179	181	Louisville Ry.....pfd	100	2,500,000	2,500,000	2 1/4 % S., Oct. 1,
Brooklyn N. Y.—June 17:						Minneapolis, Minn.—June 17					
Brooklyn City Ry.....	100	2,000,000	1,928,400	—	245	250	Twin City Rapid Transit.....com	100	17,000,000	15,010,000	—
Brooklyn Rap. Transit Co., tr. cert.	100	43,000,000	43,000,000	—	81	81 1/4	Twin City Rapid Transit.....7 % 1st	—	8,000,000	1,712,200	1 1/4 % Oct.,
Brooklyn Heights Railroad.....	—	200,000	200,000	—	107	109	Montreal, Canada.—June 17				
*Brooklyn City RR.....guar	100	12,000,000	12,000,000	8 1/4 % Q., Jan.,	267	289	Montreal Street Ry. Co.....	50	4,000,000	4,000,000	8 % S., M. & N.
*Brooklyn, Queens Co. & Sub. RR.	100	2,000,000	2,000,000	—	325	330	Toronto Street Ry. Co.....	100	6,000,000	6,000,000	1 1/4 % S., J. & J.
Coney Island & Brooklyn RR.....	100	2,000,000	1,884,200	2 1/4 % Nov.,	—	—	Memphis Tenn.—June 17				
Kings County Elevated.....	100	4,750,000	4,750,000	—	—	—	Memphis Street Railway Co.....	100	500,000	500,000	—
Kings County Traction Co.....	100	4,500,000	4,500,000	1 % July	—	—	New Haven, Conn.—June 17:				
Nassau Electric Railroad.....pfd.	50	6,000,000	6,000,000	—	82	83	Fair Haven & Westville RR.....	25	2,000,000	2,000,000	8 % S., Sept.
Atlantic Avenue Railroad.....	50	2,000,000	2,000,000	—	—	—	New Haven Street Railway Co.....	100	1,250,000	1,000,000	2 1/4 % A., July
*Brooklyn, B. & W. E. Railroad..	—	1,000,000	1,000,000	—	—	—	New Haven & Centerville.....	100	700,000	800,000	—
Buffalo N. Y.—June 17						New Orleans, La.—June 17					
Buffalo & Niagara Falls Elec. Ry....	100	1,250,000	1,250,000	—	74	75	Canal & Claiborne RR. Co.....	40	240,000	240,000	4 % S., July
*Buffalo Railway Co.....	100	6,000,000	5,870,500	1 % Q. Dec.	99	100	New Orleans & Carrollton RR.....	100	1,200,000	1,200,000	1 1/4 % Q., Oct.
Columbus O.—June 17						New Orleans Traction Co new com.					
Columbus Street Railroad.....	100	8,000,000	8,000,000	1 % Q., Feb.	38	39	New Orleans Traction Co new pfd.	100	—	—	—
Columbus Street Railroad, pfd....	100	1,500,000	1,500,000	—	100	102	*Crescent City RR.....guar.	100	2,000,000	2,000,000	8 % S., Jan.,
Charleston, S. C.—June 17						New Orleans City & Lake RR.....guar.					
Charleston City Ry. Co.....	50	100,000	100,000	8 % S.	—	—	Orleans Railroad.....	50	500,000	185,000	1 1/4 % S., Jan.,
Enterprise City RR. Co.....	25	1,000,000	250,000	—	—	—	St. Charles Street Railway.....	50	1,000,000	1,000,000	1 1/4 % Oct.,
Chicago, Ill.—June 17						New York—June 17:					
Chicago City Ry. Co.....	100	12,000,000	12,000,000	8 % Q., Dec. 31,	250	260	Central Crosstown RR.....	100	600,000	600,000	2 1/4 % Q.
Chicago & South Side R. T. RR.....	100	10,828,800	10,828,800	—	—	—	*Christopher & 10th Sts. RR. guar.	100	650,000	650,000	2 % Q., Oct.,
Lake Street Elevated RR.....	100	10,000,000	10,000,000	—	18 1/4	14	Dry Dock, E. Bldg. & Battery RR.	100	1,200,000	1,200,000	1 1/4 % Q., Nov.
Metropolitan West Side Elev. Ry....	100	15,000,000	7,000,000	Feb. 28 1900.	34 1/2	35	*Metropolitan Street Ry. Co.....	100	45,000,000	45,000,000	2 1/4 % Q., Feb. 1901.
Met. West Side El., pfd.....	100	15,000,000	9,000,000	—	92	92 1/4	*Bleecker St. & Fulton Fy. Ry. guar.	100	900,000	900,000	2 1/4 % A., July,
North Chicago Street RR.....	100	10,000,000	6,600,000	8 % Q., Jan.	209	210	*Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000	2 1/4 % Q.
*North Chicago City RR.....	100	500,000	249,900	—	200	201	*Gen. Park N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2 1/4 % Q.
South Chicago City Railway.....	100	2,000,000	1,608,200	—	108	109	*Eight Avenue RR.....	100	1,000,000	1,000,000	—
West Chicago St. RR. Co.....	100	20,000,000	18,189,000	1 1/4 % Q., Feb.	103	103 1/2	*42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	4 1/4 % Q.
Union Traction Ry.....com	100	1,250,000	—	8 % S.	18 1/2	18 1/4	*Ninth Avenue trn.....guar.	100	800,000	800,000	—
Union Traction Co.....pref	100	2,000,000	2,000,000	—	59	59 1/4	*Sixth Avenue RR.....	100	2,000,000	2,000,000	—
Cincinnati, Ohio.—June 17:						Second-third St. R. R. Co. guar.					
Cincinnati Inc. Plane Ry.....com	50	1,000,000	575,000	—	—	—	Third Avenue RR.....	100	2,500,000	1,862,000	2 % Q., Jan.,
Cincinnati Inc. Plane Ry.....pfd	50	150,000	150,000	—	—	—	*42d St. Manhattan & St. Nich. Av	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.
Cincinnati, Newport & Cov. St. Ry	100	8,000,000	8,500,000	2 1/4 % Feb.	75	76	*Union (Huckleberry) Ry.....	100	2,500,000	2,500,000	—
Cincinnati Street Ry. Co.....	50	18,000,000	14,000,000	1 1/4 % Q., Jan.	124 1/2	125	Newark N. J.—June 17				
*Mt. Adams & Eden Park Inc. Ry	50	2,500,000	2,200,000	1 1/4 % Q., Jan.	126 1/2	127	Consolidated Traction Co. of N. J..	100	15,000,000	15,000,000	—
Cleveland, Ohio.—June 17:						North Jersey Railway Co.....					
Akron, Bed. & Cleve. Elec. Ry.....	100	1,000,000	1,000,000	3/4 % Jan.	48	50	United Elec. Co. of New Jersey..	100	6,000,000	6,000,000	—
Cleveland City Ry.....	100	8,000,000	7,600,000	3-5 % Jan.	100	102	Pittsburg, Pa.—June 17				
Cleveland Electric Ry.....	100	12,000,000	12,000,000	3/4 % Q., Oct.,	80	81	Allegheny Traction Co.....	50	500,000	—	—
Detroit, Mich.—June 17						Consolidated Traction Co.....com.					
Detroit Citizens' Street Ry.....	100	2,000,000	1,250,000	—	100 1/2	—	Consolidated Traction Co.....pfd.	50	9,478,850	15,00,000	2 % Jan.
*Wayne & Belle Isle Ry.....	100	1,200,000	—	—	175	—	*Central Traction Co.....	50	1,500,000	—	8 % Nov.
Rapid Railway Co.....	—	250,000	250,000	—	90	100	*Citizens' Traction Co.....	50	8,000,000	—	1 1/4 % Nov.
Detroit Electric Railway.....	—	1,000,000	1,000,000	—	—	—	*Duquesne Traction Co.....	50	8,000,000	—	6 % A.
Wyandotte & Detroit River Ry....	100	250,000	200,000	—	100	110	*Pittsburg Traction Co.....	50	2,500,000	—	8 % Nov.
Dayton O.—June 17:						Federal St. & Pleasant Valley Ry..					
City Railway Co.....co 1	100	1,500,000	1,470,600	1 1/4 % Q.	140	145	Pgh., Allegheny & Man. Trac. Co..	25	1,400,000	—	2 % Aug.
City Railway Co.....p 1	100	600,000	600,000	1 1/4 % Q.	170	—	Pittsburg & Birmingham Trac. Ry.	25	1,500,000	—	1 % Oct.
People's Street Railway.....	—	1,100,000	1,100,000	—	114	115	Pittsburg & West End Ry.....	50	8,000,000	—	5 % A., June

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Leased to Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau Electric RR.

h \$80 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; \$250,000 of stock owned by North Chicago Street Railroad Company.

i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j 85 % per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,000 of stock owned by West Chicago Street Railroad Company.

k Majority of stock owned by Chicago West Division Railway Company; 5 % on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lease.

l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex-div.

a Leased to New Orleans Traction Company at 6 % on stock.

b Leased to New Orleans Traction Company at 8 % on stock.

c Leased to Central Crosstown Railroad at 8 % on stock and interest on bonds.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Pavyon Ferry—now Metropolitan Street Railway.

g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1895, at \$215,000 per annum.

i Leased to Met. St. Ry. for 99 years from April 1, 1892; 6 % first 5 years, 8 % thereafter.

j Leased to Metropolitan Street Railway for \$145,000 per annum.

k Leased to Metropolitan Street Railway for 18 % on capital stock.

l Controlled by Third Avenue Railroad by purchase.

m Dividends of 1 1/4 % yearly guaranteed by Consolidated Traction Company.

n Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.

o Leased to Consolidated Traction Company for 8 % per annum on par value of stock.

p Leased to Fort Pitt Traction Company for 6 % on \$3,000,000 capital stock.

q Leased to Consolidated Traction Company for 4 % on capital stock.

r Leased to Consolidated Traction Company for 7 % on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock.		Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital Stock.		Rate and Date of Last Div.	Bid.	Asked.
		Author'd	Issued.						Author'd	Issued.			
New Bedford Mass.—June 17							Boston, Mass.—June 17						
Union Street Railway Co.....	100	\$850,000	\$850,000	2% Feb.	160	165	American Tel. & Tel. Co.....	100	50,000,000	28,850,000	4% Q. Jan.	173	173 1/4
Northampton, Mass.—June 17							Erie Telegraph & Telephone Co.....						
Northampton Street Ry.....	100	500,000	225,000	4% A., June.	170	173	New England Telephone Co.....	..	10,894,600	10,804,600	\$1.50 p. sh. Feb.	142	143
Omaha, Neb.—June 17							New York.—June 17						
Omaha Street Ry.....	100	5,000,000	5,000,000	8% A. and N.	55	65	American Telephone & Cable Co....	100	14,000,000	14,000,000	1% Q. Q.	91	94
Paterson N. J.—June 17							*Central & South Am. Tel. Co.....						
Paterson Ry. Co.....	100	1,250,000	1,250,000	.....	54	..	*Commercial Cable Co.....	100	6,500,000	6,500,000	1% Q. Q.	100	108
Providence, R. I.—June 17							Franklin Tel. Co..... 2% guar.						
United Traction & Electric Co....	100	8,000,000	8,000,000	3% Q. Oct.	109	110	Erie Telephone & Telephone Co.....	100	1,000,000	.....	1% Q. S.	42	80
Philadelphia.—June 17							*Gold & Stock Tel. Co. guar. 6%						
Fairmount Park Trans. Co..... \$50 pd.	50	2,000,000	1,770,000	2% Dec.	28	24	*International Ocean Tel. Co. guar. 6%	100	5,000,000	4,800,000	1% Q. Feb.,	108	109
Bestonville, Man. & Fairmount.....	50	1,966,100	1,966,100	2% Q., July 15,	47	48	*Mexican Telephone Co.....	100	8,000,000	.....	1% Q. Q.	116	116 1/2
Bestonville, Man. & Fairmount..... 6% pfd.	50	583,900	583,900	8% S. July,	75	76	*New York & New Jersey Tel. Co....	100	5,000,000	3,728,000	2% Q. Q. Jan.,	163	178
aFairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	8% Feb. 1,	27 1/2	28	*Pacific & Atlantic Tel. Co. guar. 4%	25	2,000,000	.....	2% Q. S.	70	75
Union Traction Co..... \$12 1/2 pd.	50	30,000,000	29,980,450	.....	30	30 1/4	*Postal Telegraph Cable Co.....	100	15,000,000	15,000,000	1% Q. S.	95	100
Electric Traction Co.....	50	.....	8,297,920	.....	345	.....	*Sout'n & Atlantic Tel. Co. guar. 5%	25	950,000	559,525	1% Q. S.	95	100
dCitizens' Passenger Ry.....	50	500,000	192,500	3% share Q.	400	451	Commercial Union Telephone Co....	25	500,000	500,000	8% S. Jan.,	118	118
eFrankford & Southwark Pass. R.	50	1,000,000	1,875,000	\$14 share A.—Apr.	48	.....	Western Union Telephone Co.....	..	.....	97,870,000	1% Q. Q. Jan.	95 1/2	95 1/2
fLehigh Avenue Ry. Co.....	50	1,000,000	.....	.....	90	90 1/2	*Div. guar. by Postal Tel. Co.						
gLombard & South Street Ry.....	25	1,000,000	1,000,000	A. & O.	800	.....	Miscellaneous.—June 17						
hSecond & Third Streets Ry.....	50	1,000,000	771,076	3% share A. Mar.	150	151	American Dist. Tel. (Phila.).....	25	400,000	.....	1% Q.	28	87
iPeople's Traction Co.....	50	10,000,000	10,000,000	8% A., April,	151	152	Bell Tel. Co. (of Canada).....	100	3,960,000	3,561,000	2% S.	188	..
jGermantown Passenger Ry.....	50	1,500,000	872,800	\$5.25 share—	151	152	Chesapeake & Potomac Tel. Co....	100	.....	.....	.....	67	70
kGreen & Coates Passenger Ry.....	50	500,000	150,000	8% Jan.,	151	152	Chicago Telephone Co.....	100	.....	.....	.....	200	210
lPeople's Passenger Ry..... com.	25	1,500,000	740,000	.....	95	95 1/4	Central Dist. Prtg. & Tel. Co. (Phg.)	100	750,000	750,000	.....	148	160
mPeople's Passenger Ry..... pfd.	50	750,000	277,402	.....	151	152	Empire & Bay States Telegraph Co.	100	.....	.....	.....	78	76
nPhiladelphia Traction Co.....	50	30,000,000	120,000,000	\$2 p. sh. Oct.	158	157	Hudson River Telephone Co.....	109	2,000,000	2,000,000	1% Q.	120	125
oCatherine & Bainbridge St.....	50	.....	400,000	6% A.—Mar.	100	100	*Northwestern Telephone Co. guar.	50	2,500,000	2,500,000	2% Q. Q.	122	125
pContinental Pass. Ry. guar.....	50	1,000,000	540,000	\$6 share—July	100	100	Providence (R. I.) Tel. Co.....	50	.....	.....	.....	96	99
qEmpire Passenger Ry. Co.....	50	600,000	600,000	.....	100	208 1/4	Southern New Eng. Tel. Co.....	100	8,000,000	.....	.....	..	..
rPhiladelphia City Pass. Ry.....	50	1,000,000	475,000	\$7.50 share July	100	100	Boston, Mass.—June 17						
sPhiladelphia & Gray's Fy. RR.....	50	1,000,000	298,650	\$8.50 share July	100	100	Fort Wayne Electric Trust Receipts	25	.....	.....	.....	115	115
tEdge Avenue Passenger Ry.....	50	750,000	420,000	\$12 share, July	100	100	Fl. Wayne Elec. Co. T. Sec. Series A.	25	.....	.....	.....	15	25
uPhiladelphia & Dart. Ry. guar.....	50	.....	200,000	\$2 share July,	100	100	General Electric Co. [old] com.	100	40,000,000	80,460,000	2% Q. Aug., 1898.	248	248 1/4
v15th & 19th Sts. Pass. Ry. guar.	50	.....	250,000	1% Q. S., July,	100	100	General Electric Co. [new] com.	100	18,276,000	18,276,000	1% Q. Apr., 1901	248	248 1/4
wThirteenth & 15th Sts. Pass. Ry.	50	1,000,000	885,000	\$11 sh. A., July,	100	100	T. H. Elec. Co. T. Secur. Series C.	50	.....	145,700	.....	70	70 1/4
xUnion Passenger Ry. Co.....	50	1,500,000	900,000	\$9.50 shre, July	100	100	Westinghouse Elec. & Mfg. Co. com.	50	4,000,000	3,998,088	1% Q. Jan.,	75 1/2	76
yWest Philadelphia Pass. Ry.....	50	750,000	750,000	\$10 share, July,	100	100	Westinghouse El. & Mfg. Co. pfd.	50	11,000,000	8,195,126	.....	134	134
Rochester, N. Y.—June 7							New York.—June 17						
Rochester Railway Co.....	100	5,000,000	5,000,000	.....	25	28	Edison Elec. Ill'g Co., New York....	100	9,188,000	7,988,000	.....	119	130
Reading, Pa.—June 17							*Edison Elec. Ill'g Co., Brooklyn....						
Reading Traction Co.....	..	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26	Edison Ore Milling Co.....	100	4,000,000	2,000,000	1% Q. Oct., '98.	8	12
City Passenger Ry.....	50	850,000	850,000	Jan.,	188	..	Electric Vehicle Co.....	100	.....	.....	.....	..	..
East Reading Electric Ry.....	50	1,000,000	1,000,000	Jan.,	70	..	General Electric Co. [old] com.	100	40,000,000	80,460,000	2% Q. Aug., 1898.	248	248 1/4
St. Louis Mo.—June 17							General Electric Co. [new] com.						
Fourth Street & Arsenal Ry.....	50	800,000	150,000	.....	..	..	Interior Conduit & Insulation Co....	100	18,276,000	18,276,000	1% Q. Apr., 1901	247 1/4	248
Jefferson Avenue Ry. Co.....	50	400,000	400,000	2% Dec.	..	..	Interior Conduit & Insulation Co....	100	1,000,000	1,000,000	A. & O.	110	136
Lindell Ry.....	100	2,500,000	2,400,000	1% Jan.	..	..	Kings Co. El. L. & P. Co.....	100	2,500,000	2,500,000	.....	..	..
National Railway Co.....	..	2,500,000	2,479,000	1% Jan.	..	..	Pittsburg, Pa.—June 17						
Cass Avenue & Fair Grounds.....	..	2,500,000	2,500,000	.....	..	..	Allegheny County Light Co.....	100	500,000	500,000	J. & J.	168	172
Citizens' RR.....	100	2,000,000	1,500,000	4% Oct.	..	..	East End Electric Light Co.....	50	800,000	800,000	Q	..	..
St. Louis RR.....	100	2,000,000	2,000,000	2% Jan.,	..	..	Philadelphia, Pa.—June 17						
Missouri RR.....	50	2,400,000	2,800,000	1% Jan.,	..	..	Edison Electric Light Co.....	100	2,000,000	.....	.....	144	144 1/2
People's RR. Co.....	50	1,000,000	800,000	50c. Dec.	24	25	*Electric Storage Battery Co. com.	100	8,500,000	.....	.....	54	54 1/2
United Electric Ry.....	50	500,000	500,000	.....	24	25	*Electric Storage Battery Co. pfd.	100	5,000,000	.....	.....	54	55
United Electric Ry..... 5% pref.	100	1,000,000	1,000,000	8% Jan.,	78 1/4	79	Northern Elec. Light & Power Co..	10	550,000	550,000	.....	18	18 1/2
t. Louis & Suburban Ry.....	100	8,000,000	2,500,000	.....	90	93	Southern Elec. Light & Power Co..	10	187,500	187,500	.....	80	..
Union Depot RR.....	100	4,000,000	4,000,000	8% A., July,	..	..	Miscellaneous.—June 17						
San Francisco, Cal.—June							Bridgeport (Conn.) Elec. Lt. Co....						
California St. Cable RR.....	100	1,000,000	600,000	50c. monthly.	117	119	Missouri-Edison (St. Louis) com.	25	500,000	.....	.....	47	48
Geary Street Park & Ocean RR.....	100	1,000,000	875,000	\$2.50 share,	61 1/2	63 1/2	Eddy Electric Mfg. Co.....	25	.....	.....	.....	20	21
Market Street Ry.....	100	18,750,000	18,750,000	Q., 60c. per share.	61 1/2	63 1/2	Hartford (Conn.) Elec. Light Co....	100	850,000	.....	.....	9	11
Presidio & Ferries RR.....	100	1,000,000	850,000	.....	16	16	Hartford (Conn.) Lt. & Power Co....	25	175,000	.....	.....	190	191
Scranton Pa.—June 17							New Haven (Conn.) Elec. Lt. Co....						
Scranton Railway Co.....	50	6,000,000	2,500,000	.....	29	30	Narragansett (Prov. R.I.) Elec. Co..	50	1,200,000	.....	2% Q., Oct.,	195	..
mScranton & Carbondale Trac. Co..	100	500,000	500,000	.....	16 1/2	..	Rhode Island Elec. Protec. Co.....	50	.....	.....	.....	108	104
nScranton & Pittston Traction Co..	100	1,050,000	1,050,000	.....	..	..	Royal Elec. Co. (Montreal).....	100	1,320,000	.....	1% Q.	118 1/2	120 1/2
Springfield Ill.—June 17							Toronto (Canada) Elec. Light Co....						
Springfield Consolidated Ry.....	100	750,000	750,000	.....	..	..	Thomson-Houston Welding Co.....	100	1,085,000	1,085,000	1% Q.	120	121
Springfield O.—June 17							Thomson-Houston Welding Co.....						
Springfield Street Ry.....	100	1,000,000	1,000,000	.....	..	11	Woonsocket (R. I.) Electric Co.....	100	.....	.....	8% S. Dec. 1,	120	120
Springfield, Mass.—June 17							Allied Industries.						
Springfield Street Ry.....	100	1,200,000	1,166,700	8% A.	207	212	Boston Mass.—June 17						
Toronto Canada.—June 17							American Electric Heating Co.....						
Toronto Street Ry.....	100	6,000,000	6,000,000	1% S.	109 1/4	110 1/4	Street Ry. & Ill'g Properties... pfd.	50	10,000,000	.....	.....	..	..
Montreal Street Railway Co.....	.....	4,000,000	4,000,000	4% S.	279	280	United Electric Securities Co..... pfd.	100	4,500,000	1,248,700	\$2 p. sh.	..	..
Washington, D. C.—June 17							United Electric Securities Co.....						
Belt Ry. Co.....	50	500,000	500,000	.....	103 1/2	103 1/2	New York.—June 17						
Capital Traction Co.....	100	12,000,000	12,000,000	65c. per sh. Oct.	103 1/2	103 1/2	Consolidated Electric Storage Co..	100	.....	.....	.....	8	12
Columbia Ry. Co.....	50	400,000	400,000	6% A.	85	40	Safety Car Heating & Lighting Co..	100	.....	.....	.....	180	185
Kingston & Soldiers' Home Ry.....	50												

BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

NAME.								Amount.		Interest periods.		NAME.		Amount.		Interest periods.							
Authorized.								Issued.		Due		Authorized.								Issued.		Due	
Albany N. Y.								New Orleans La.								New York.							
Date of Quotation—June 17, 1901								Date of Quotation—June 17, 1901.								Date of Quotation—June 7, 1901.							
The Albany Ry. Co. Cons. mtg. 5s	850,000	427,500	1940	J. & J.	117½			Canal & Claiborne RR. cons mtg. 5s	\$150,000	\$150,000	1912	M. & N.			Atlantic Ave. (Brooklyn) Imp. g. 5s	1,500,000	1,500,000	1904	J. & J.	96			
The Albany Ry. Co. Gen. mtg. 5s	750,000	875,000	1947	M. & N.	116½			Oreosent City RR. 1st mtg. 5s		80,000	1899	M. & N.	106½		Atlantic Av. (Brooklyn) 1st gen. mtg. 5s	799,000	799,000	1909	M. & S.	107½	110		
Watervliet Turnpike & RR. 1st mtg. 5s	850,000	850,000	1919	M. & N.	125			Oreosent City RR. Cons. mtg. g. 5s	5,000,000	8,000,000	1948	J. & J.			Atlantic Av. (Brooklyn) Cons. mtg. 5s	8,000,000	1,968,000	1981	A. & O.	115	116		
Watervliet Turnpike & RR. 2d mtg. 5s	150,000	150,000	1919	M. & N.	124	1 6		New Orleans City RR. 1st mtg. 5s	416,500	899,000	1908	J. & J.	106	112	Bro'dway & 7th Ave. 1st cons. mtg. g. 5s	12,500,000	7,000,000	1948	J. & J.	128	125		
Troy City Railway Co. 1st 5s			1942		116	117		N. Orleans City & Lake RR. 1st mtg. g. 5s	5,000,000	2,999,500	1948	J. & J.	113	118	Broadway & 7th Ave. 1st mtg. 5s	1,500,000	1,500,000	1904	J. & J.	104	108½		
Interest guar. by Albany Ry. Co. Principal and interest guar. by Albany Ry. Co.								Oreosent City RR. Cons. mtg. g. 5s	800,000	800,000	1907	F. & A.			Broadway & 7th Ave. 2d mtg. 5s	500,000	500,000	1914	J. & J.	108	110½		
								St. Charles St. RR. Co. 1st mtg. 5s	800,000	75,000	1906	J. & J.			Broadway Surface. 1st mtg. 5s	1,125,000	1,125,000	1924		115	117		
								\$425,500 in escrow to retire New Orleans City RR. Co.'s 1st mtg. bonds. \$390,000 outstanding.							Broadway Surface. 2d mtg. 5s	1,000,000	1,000,000	1906		105	106		
								New York.								Brooklyn City RR. Co. 1st cons. mtg. 5s	6,000,000	6,000,000	1941	J. & J.	116	117	
								Date of Quotation—June 7, 1901.								Brooklyn City & Newtown. 1st mtg. 5s	2,000,000	2,000,000	1909	J. & J.	115	116	
								Atlantic Ave. (Brooklyn) Imp. g. 5s	1,500,000	1,500,000	1904	J. & J.	96		Brooklyn Bath & W.E. RR. Gen. mtg. 5s	1,000,000	448,000	1988	J. & J.	101			
								Atlantic Av. (Brooklyn) 1st gen. mtg. 5s	799,000	799,000	1909	M. & S.	107½	110	Brooklyn Heights RR. 1st mtg. 5s	250,000	280,000	1941	A. & O.	104			
								Atlantic Av. (Brooklyn) Cons. mtg. 5s	8,000,000	1,968,000	1981	A. & O.	115	116	Brooklyn Q's Co. & Sub'n. 1st mtg. 5s	8,500,000	8,500,000	1941	J. & J.	112			
								Bro'dway & 7th Ave. 1st cons. mtg. g. 5s	12,500,000	7,000,000	1948	J. & J.	128	125	Brooklyn Q's Co. & Sub'n. 1st cons. 5s	4,500,000	2,750,000	1941	M. & N.	107			
								Broadway & 7th Ave. 1st mtg. 5s	1,500,000	1,500,000	1904	J. & J.	104	108½	Brooklyn Rapid Transit. gold 5s	7,000,000	5,181,000	1945		108½	109		
								Broadway & 7th Ave. 2d mtg. 5s	500,000	500,000	1914	J. & J.	108	110½	Bleecker St. & Fulton Ferry RR. 1st mtg. 7s	1,200,000	1,200,000	1902	J. & D.	107	109		
								Broadway Surface. 1st mtg. 5s	1,125,000	1,125,000	1924		115	117	Central Croton RR. 1st mtg. 4s	225,000	225,000	1922	M. & N.	125			
								Broadway Surface. 2d mtg. 5s	1,000,000	1,000,000	1906		105	106	Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1908	J. & J.	101	108		
								Brooklyn City RR. Co. 1st cons. mtg. 5s	6,000,000	6,000,000	1941	J. & J.	116	117	2d Dock, E. Bd'y & Bal'y RR. 1st mtg. 5s	1,000,000	980,000	1922	J. & D.	117	120		
								Brooklyn City & Newtown. 1st mtg. 5s	2,000,000	2,000,000	1909	J. & J.	115	116	Dry Dock, E. Bd'y & Bal'y RR. gen. mtg. g. 5s	100,000	1,100,000	1914	F. & A.	102	105		
								Brooklyn Bath & W.E. RR. Gen. mtg. 5s	1,000,000	448,000	1988	J. & J.	101		Elizbeth Av. RR. Co. Cert. Indeb't 6 ½	200,000	1,000,000	1914	F. & A.	108	117		
								Brooklyn Heights RR. 1st mtg. 5s	250,000	280,000	1941	A. & O.	104		42d St. Man. & St. Nich. Av. 1st mtg. 6s	1,500,000	1,500,000	1910	M. & S.	115½	119		
								Brooklyn Q's Co. & Sub'n. 1st mtg. 5s	8,500,000	8,500,000	1941	J. & J.	112		42d St. Man. & St. Nich. Av. 2d mtg. inc. 6s	5,000,000	5,000,000	1906	M. & S.	124	125		
								Brooklyn Q's Co. & Sub'n. 1st cons. 5s	4,500,000	2,750,000	1941	M. & N.	107		Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s	12,500,000	12,500,000	1907	F. & A.	120			
								Brooklyn Rapid Transit. gold 5s	7,000,000	5,181,000	1945		108½	109	Metropolitan St Ry Co. g. m. cl. tr. g. 5s	1,600,000	1,600,000	1909	M. & N.	120	121		
								Bleecker St. & Fulton Ferry RR. 1st mtg. 7s	1,200,000	1,200,000	1902	J. & D.	107	109	Second Avenue Ry. Gen. cons. mtg. 5s	800,000	800,000	1909	J. & J.	124½	109		
								Cent Pk. N. & E. RR. 1st cons. mtg. 4s	280,000	280,000	1922	M. & N.	125		Second Avenue Ry. Cons. mtg. 5s	800,000	800,000	1909	J. & J.	124½	109		
								Central Croton RR. 1st mtg. 4s	225,000	225,000	1922	M. & N.	125		Steinway Ry. (L. I.) 1st mtg. g. 5s	1,500,000	1,500,000	1922	J. & J.	116	117		
								Coney Island & Brooklyn RR. 1st mtg. 5s	800,000	800,000	1908	J. & J.	101	108	South Ferry RR. Co. 1st mtg. 5s	850,000	850,000	1919		112½	113½		
								2d Dock, E. Bd'y & Bal'y RR. 1st mtg. 5s	1,000,000	980,000	1922	J. & D.	117	120	Third Avenue RR. 1st mtg. 5s	5,000,000	5,000,000	1907	J. & J.	128½			
								Dry Dock, E. Bd'y & Bal'y RR. gen. mtg. g. 5s	100,000	1,100,000	1914	F. & A.	102	105	Twenty-third Street Ry. 1st mtg. 5s			1909	J. & J.				
								Elizbeth Av. RR. Co. Cert. Indeb't 6 ½	200,000	1,000,000	1914	F. & A.	108	117	Twenty-third Street Ry. Deb. 5s	150,000	150,000	1906	J. & J.	106	108		
								42d St. Man. & St. Nich. Av. 1st mtg. 6s	1,500,000	1,500,000	1910	M. & S.	115½	119	Union (Huckleberry) Ry. 1st mtg. 5s	2,000,000	2,000,000	1942	F. & A.	118	116		
								42d St. Man. & St. Nich. Av. 2d mtg. inc. 6s	5,000,000	5,000,000	1906	M. & S.	124	125	Westchester Electric RR. 1st mtg. 5s	500,000	500,000	1948	J. & J.	110	114		
								Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s	12,500,000	12,500,000	1907	F. & A.	120	.....	\$1,085,000 in escrow to retire gen. mtg bonds. \$34,850,000 in escrow to retire maturing obligations. \$652,000 in escrow to retire 1st and 2d mtg. bonds. In treasury, \$80,000. Guar. by Union Ry. Co.								
								Metropolitan St Ry Co. g. m. cl. tr. g. 5s	1,600,000	1,600,000	1909	M. & N.	120	121	Toronto Canada.								
								Second Avenue Ry. Gen. cons. mtg. 5s	800,000	800,000	1909	J. & J.	124½	109	Date of Quotation—June 17, 1901								
								Second Avenue Ry. Cons. mtg. 5s	800,000	800,000	1909	J. & J.	124½	109	Montreal St. Ry. 1st mtg. 5s								
								Steinway Ry. (L. I.) 1st mtg. g. 5s	1,500,000	1,500,000	1922	J. & J.	116	117	Toronto St. Ry. 1st mtg. g. 4½s								
								South Ferry RR. Co. 1st mtg. 5s	850,000	850,000	1919	.....	112½	113½	\$485,000 per m. single track authorized \$600,000 in escrow to retire 6s due in 1901								
								Third Avenue RR. 1st mtg. 5s	5,000,000	5,000,000	1907	J. & J.	128½	.....	Philadelphia.								
								Twenty-third Street Ry. 1st mtg. 5s	.....	.....	1909	J. & J.	.....	.....	Date of Quotation—June 17, 1901								
								Twenty-third Street Ry. Deb. 5s	150,000	150,000	1906	J. & J.	106	108	Continental Pass. Ry. 1st mtg. 6s								
								Union (Huckleberry) Ry. 1st mtg. 5s	2,000,000	2,000,000	1942	F. & A.	118	116	Empire Pass. Ry. 1st mtg. 7s								
								Westchester Electric RR. 1st mtg. 5s	500,000	500,000	1948	J. & J.	110	114	Greene & Coates St. Ry. 1st mtg. 6s								
																Lombard & So. St. Pass. Ry. 1st mtg. 6s							
																People's Pass. Ry. 1st mtg. 7s							
																People's Pass. Ry. 2d mtg. 5s							
																People's Pass. Ry. Cons. mtg. 5s							
																People's Pass. Ry. 3rd trs. cert. g. 4s							
																Phila. City Passenger Ry. 1st mtg. 5s							
																Philadelphia Trac. Co. Coll. tr. g. 4s							
																Thirteenth & 15th St. Ry. 1st mtg. 7s							
																Union Passenger Ry. 1st mtg. 5s							
																Union Traction Co. Coll. tr. 4s							
																West End Passenger Ry. 1st mtg. 7s							
																West Phila. Pass. Ry. 1st g. 6s							
																West Phila. Pass. Ry. 2d mtg. 5s							
																The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.							
																Pittsburg Pa.							
																Date of Quotation—June 17, 1901							
																Birmingham, Knox & Allentown. 5s							
																Central Traction Co. 1st mtg. 5s							
																Citizens' Traction Co. 1st mtg. 5s							
																Duquesne Traction Co. 1st mtg. 5s							
																Fed'l St. & Pleasant Valley. Cons. 5s							
																Fed'l St. & Pleasant Valley. Cons. 5s							
																Millvale, Etna & Sharpsburg. 5s							
																Pittsburg, Crafton & Mansfield. 5s							
																Pittsburg Traction Co. 1st mtg. 5s							
																Pittsburg & Birmingham. 1st mtg. 5s							
																Pittsburg & West End. 1st mtg. 5s							
																Pgh. Allegh. & Manch. Gen. mtg. 5s							
																Second Ave. Traction Co. 5s							
																Sub. Rapid Transit Railway Co. 5s							
																Providence R. I.							
																Date of Quotation—June 17, 1901							
																Newport Street Ry. Coupon 5s							
																United Trac. & Elec. Co. 1st mtg. g. 5s							
																St. Louis.							
																Date of Quotation—June 17, 1901.							
																Baden & St. Louis RR. 1st mtg. 5s							
																Cass Ave. & Fair Gds Ry. 1st mtg. 5s							
																Citizens' Railway Co. 1st mtg. 5s							
																Comp. Hts. Un. Pa. & Mer. Tr. 1st							

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bid.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—June 17 1901						
Jefferson Avenue Ry.....1st mtg. 5s.	270,000	270,000	1906	M. & N.	162	118
Lindell Ry. Co.....1st mtg. 5s.	1,000,000	1,500,000	1911	F. & A.	167	118
Missouri RR. Co.....1st mtg. 5s.	1,000,000	700,000	1916	M. & S.	105	106
Mound City RR. Co.....1st mtg. 6s.	400,000	800,000	1910	A. & O.	104½	105½
People's RR. Co.....1st mtg. 6s.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 7s.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 6s.	1,000,000	800,800	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric.....1st mtg. 6s.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 6s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
St. Louis & Sub. Ry.....1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 6s.	800,000	800,000	.....	.....	80	84
Southern Electric Ry.....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
Taylor Avenue St. Ry.....1st mtg. g. 6s.	500,000	500,000	1913	J. & J.	116½	117½
Union Depot RR. Co.....1st cons. mtg. 6s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.....Cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122
†Controlled by St. Louis RR. Co.						
†Controlled by Union Depot RR. Co.						
†Controlled by Lindell RR. Co.						
†\$200,000 in escrow to retire 1st & 2d mtg.						
†\$500,000 in escrow.						
†\$200,000 in escrow to retire 1st mtg. 6s.						
oda.						
San Francisco Cal.						
Date of Quotation—June 1901.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
†Ferries & Cliff House Ry.....1st mtg. 6s.	650,000	650,000	1914	M. & S.	.....	117
Geary St., Park & Ocean RR.....1st mtg. 5s.	1,000,000	671,000	1921	A. & O.	.....	96
Market St. Cable Ry. Co.....1st mtg. g. 6s.	8,000,000	8,000,000	1918	J. & J.	126½	.....
†Metropolitan Ry. Co.....1st mtg. 6s.	200,000	.....	.....	.....	.....	.....
†Omnibus Cable Co.....1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	.....
†Park & Cliff House RR.....1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
†Park & Ocean RR.....1st mtg. 6s.	250,000	250,000	1914	J. & J.	115	.....
†Powell St. Ry.....1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
†Sutter St. Ry. Co.....1st mtg. g. 5s.	1,000,000	900,000	1918	M. & N.	.....	.....
†Controlled by Market St. Ry. Co.						
Washington D. C.						
Date of Quotation—June 17, 1901						
Belt Ry. Co.....Cons. mtg. 5s.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 6s.	500,000	500,000	1914	A. & O.	132	.....
Eckington & Soldiers' Home.....1st mtg. 6s.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	.....	.....
†\$20,000 in escrow to retire 1st mtg. 6s.						
Miscellaneous						
Date of Quotation—June 17, 1901						
Bridgeport Traction Co.....1st mtg. 5s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 5s.	5,000,000	8,548,000	1931	F. & A.	118	.....
†Cittizens St. B. (Ind'polis) 1st cons. m. 5s.	4,000,000	8,000,000	1938	M. & N.	104	105
†Cross-town St. Ry. (Buffalo) 1st mtg. 6s.	8,000,000	2,866,000	1932	M. & N.	112	118
†Columbus (O.) St. Ry.....1st cons. g. 5s.	8,000,000	2,261,000	1932	J. & J.	115	.....
Consolidated Traction (N. J.) 1st mtg. 5s.	15,000,000	18,965,000	1938	J. & D.	111½	111½
†Crosst'n St. Ry. (Col'u's, O.) 1st mtg. g. 5s.	2,000,000	572,000	1938	J. & D.	115	115½
†Denver City Cable Ry.....1st mtg. g. 6s.	4,000,000	8,800,000	1920	J. & J.	20	.....
†Denver Co. Tram'y Co.....Con. m. g. 6s.	4,000,000	922,000	1938	A. & O.	80	85
†Louisville (Ky.) Ry.....1st cons. mtg. g. 5s.	6,000,000	4,981,000	1930	J. & J.	119	119½
†Minneapolis St. Ry. 1st cons. mtg. g. 5s.	5,000,000	4,050,000	1919	J. & J.	110½	110½
†No. Hudson Co. Ry. (N. J.) Cons. mtg. 5s.	8,000,000	2,878,000	1928	J. & J.	108	.....
†No. Hudson Co. Ry. (N. J.) 2d mtg. 5s.	550,000	550,000	1928	M. & N.	.....	.....
†No. Hudson Co. Ry. (N. J.) Deb. 6s.	500,000	489,000	1902	F. & A.	.....	.....
†Paterson (N. J.) Ry.....Cons. mtg. g. 6s.	1,250,000	1,000,000	1931	J. & D.	.....	.....
†Paterson (N. Y.) Ry.....1st mtg. 6s.	8,000,000	2,000,000	1930	A. & O.	.....	.....
†Rochester (N. Y.) Ry.....Cons. g. 5s.	5,500,000	4,298,000	1937	.....	105½	106
†St. Paul City Ry.....Deb. g. 6s.	1,000,000	1,000,000	1900	.....	108	.....
†\$1,000,000 in escrow to retire 1st and 2d mtg. 6s.						
†\$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.						
†\$9760,000 in escrow to retire bonds of C. St. RR. Co.						
†\$87,000 in treasury.						
†\$260,000 res'vd to redeem prior liens						
†\$620,000 in escrow.						
*With Int'						

*With interest

ELECTRIC LIGHT AND ELECTRICAL MFG. COS.

Boston, Mass.						
Date of Quotation—June 17, 1901.						
Delaware Gas & L. Co.....1st m. 5s. g.	800,000	800,000	.....	J. & J.	106	108
Edison Elec. Illuminating Co., Boston.....	2,026,000	.....	.....	Quar.	187	.....
General Electric Co., gold coup. deb. 5s.	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa.						
Date of Quotation—June 17 1901						
Allegheny County Light Co.....6s.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Serip 6s.	125,570	.....	.....	M. & S.	.....	.....
Miscellaneous.—(June 7 1901.)						
Edison El. Illg. Co. (N. York) 1st m. 5s.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1938	.....	124	.....
Edison Elec. Illg. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122½	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
Edison Electric Light & Pow. Co. 1st mtg. 5s.	2,500,000	.....	1937	A. & O.	100	105
Kings Co. El. L. & Pow. Co. pur. money 6s.	5,175,000	.....	1937	A. & O.	120	122
Milwaukee El. Ry. & L. Co. 1st con. g. 5s.	8,000,000	.....	.....	F. & A.	102½	.....
United Elec. Light & Power Co. (N. Y.).....	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—June 17, 1901.						
American Bell Telephone.....6s.	.....	.....	1906	F. & A.	100½	101
Northwestern Telegraph Co.....7s.	.....	.....	.....	.....	114	115
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 5s.	.....	.....	1911	J. & D.	108	106
Chesapeake & Potomac Elec. Co.....6s.	.....	.....	.....	.....	.....	.....

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—June 17 1901.						
American Electric Heating.....7s.	500,000	500,000	.....	.....	.....	25
Armington & Sims Engine Co.....6s.	.....	.....	1942	J. & J.	106	107
Barnes & Smith Car Co.....6s.	.....	.....	1904	J. & D.	.....	.....
Carborundum Mfg. Co.....6s.	75,000	.....	.....	.....	115	127
Washington Pump Co.....6s.	.....	.....	.....	.....	.....	.....
†Womins.						

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 17@17½c.; Lake, 17½@17¾c.; casting, 16½@17c.

The Connecticut Legislature has passed a new corporation law which is similar to that of New Jersey.

All of the elevated railroads in Chicago report an increase of the June traffic over that of last year.

Toronto capitalists claim to have bought all the Twin City Rapid Transit stock not owned by President Lowry.

A dividend of 75 cents a share has been declared on Reading (Pa.) Traction stock, payable July 1, to holders of record June 25.

The United Traction and Electric Company of New Jersey has declared the regular quarterly dividend of 1 per cent., payable July 1.

Business failures in the United States last week numbered 179, against 162 the same week last year; in Canada there were 23, against 21 last year.

The North Jersey Street Railway Company will appeal from the decision which says that its right of way is taxable as real estate.

A Cleveland dispatch says that negotiations are in progress for the consolidation of all the independent telephone companies of the United States.

Nearly all of the Chicago Union Traction Company's common stock bought on the Chicago Stock Exchange last week has been taken up and will be shipped East.

It is reported that a group of New York capitalists is considering the construction of a trolley road 100 miles long through the center of the Wabash Valley in Indiana.

The Cataract Power Company, of Hamilton, Ont., has concluded negotiations with the Dundas Electric Light Company and will take over the business and right of that company.

It is said that Albert L. Johnson has obtained control of a trolley line running from New Brunswick to Keyport, N. J., which will be used toward completing his plans for a long distance trolley line.

The Westinghouse Electric and Manufacturing Company has declared the regular quarterly dividend of 1½ per cent. on its preferred stock, payable July 1. Books close June 22 and reopen July 2.

The Manchester Traction Light and Power Company controlling the electric light and street railway interests of Manchester, N. H., has declared its first semi-annual dividend of 3 per cent., payable July 15 to stock of record July 5.

The report that P. A. B. Widener, and William L. Elkins, are en route for home from London, in order to protect Philadelphia Union Traction interests, is denied. They are not expected home until late next month or early in August.

The General Electric Company is reported to have sufficient business on its books to keep all of its plants in full operation for at least two years. It is also reported that the matter of a 33½ per cent. stock dividend will receive early consideration.

The Mayor of Philadelphia has signed the local transit ordinances which had been passed through both branches of councils. They are now law, and the way is open to furnish Philadelphia rapid transit accommodation, which it greatly needs.

The Lancaster County Railway and Light Company has been incorporated at Camden, N. J., with a capital stock of \$2,000,000. The incorporators are Lewis Starr, Prosecutor of Gloucester County; Lindley M. Garrison and Assemblyman John G. Horner, of Burlington County.

Copper was very dull the past week and prices remained unchanged from the previous week. The exports showed a slight falling off from last month's business; thus far this month they amount to 4,274 tons. The production for May amounted to 22,392 tons, against 31,438 tons in April.

The following are quotations for some of the industrial stocks not quoted elsewhere: Electrical Lead Reduction, 3½@4; Electric Boat, 21@23; Electric Vehicle, 9@10½; Tel. & Tel. Company of America (full paid), 5@6; Electric Company of America, 8¼@8½; National Carbon, 15½@16.

Stockholders of the Boston Edison Electric Illuminating Company, who meet on June 24th to act on the merger with the Boston Electric Light Company, will also vote on the question of increasing the board of directors from nine to twelve members. Four Boston Electric Light Company directors will be added to the board should the increase be voted, as there is a vacancy in the present Edison board.

President Insull, of the Chicago Edison Company, says: "While our stock has been increased \$4,000,000, we shall issue only \$900,000 to stockholders at par about August 1. The other \$3,100,000 will remain in the treasury for use as the extension of business demands. This authorization gives the board of directors the right to issue new stock from the treasury at its option, but it will be put only on needed improvements."

Wall Street experienced a resumption of business activity last week, and at the close the outlook was much brighter than it has been for some time. The character of the trading left no room for doubt as to the professional control of the market. It was very evident that the public was disinclined to take any interest in the week's developments despite the uniformly good news, both at home and abroad, the daily announcement of which undoubtedly was the direct cause of the week's activity on the Stock Exchange. Nevertheless, it must be admitted that the present situation is much healthier and that there are brighter prospects than have prevailed for months.

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EDITORIAL NOTES.

What Can Be Done With Wireless Telegraphy.

Some successful experi-
ments were recently made
in transmitting pictures
by wireless telegraphy.
Mr. Ernest A. Hummel's
apparatus and methods
were made use of, which were described in
detail in the issue of *ELECTRICITY* of January
5, 1898. As will probably be recalled, Mr.
Hummel's system consists in first tracing
through a carbon paper upon a metal plate the
picture to be reproduced. The lines thus ob-
tained are then brought out prominently by
means of some non-conducting solution, as for
instance shellac. This prepared picture is
then wrapped around a cylinder, against which
lightly rests a platinum point connected in
circuit. The receiver differs little from the
transmitter, except that in place of the picture
the cylinder contains a sheet of carbon paper
between two sheets of blank paper.

In the experiment in question, which was
conducted under the auspices of the N. Y.
"Herald," the transmitter was located at a
distance of fifteen feet from the receiver with
an eight-inch brick wall between.

As the transmitting cylinder revolved when-
ever the stylus touched the shellac it caused
the closing of the induction coil circuit, with
the result that an electric wave traveled to the
receiving apparatus, causing it to respond.
The greatest difficulties Mr. W. J. Clarke, who
was carrying on the experiment, had to con-
tend with were in overcoming vibration in the
registering stylus and in regulating the co-
herer to the precise degree of sensitiveness
necessary to secure good results.

Mr. Clarke also successfully tried the light-
ing of incandescent lamps at a distance, which
was accomplished by means of a mechanical
motor used in conjunction with the receiver
of the wireless apparatus.

A practical application of this device, which
Mr. Clarke predicts will surely come, is its uti-
lization for offshore lights and beacons in the
coast lighthouse service. By enabling an op-
erator to light or extinguish at will from a
point on the mainland lamps fed either by gas,
oil or storage battery at points offshore the
expense might be saved either of maintaining
an attendant constantly on duty at the light-
house or of constructing and operating a con-
necting cable. In the operating of what is

known as a flashlight the rotating mechanism,
Mr. Clarke contends, can be started and stop-
ped, as well as wound up, from a remote point
on the mainland.

Mr. Clarke, in conjunction with members of
the United States Lighthouse Board, has
already conducted interesting experiments on
a larger scale at Tompkinsville and elsewhere.

* * *

Trolley Roads as Realty.

The recent decision of
the Supreme Court of
New Jersey that trolley
car companies must pay
their full share of taxation for local purposes,
not only in cities but in towns through which
they pass, and in addition to the taxes now
imposed by the State for State purposes, gives
especial interest again to the question of
franchise taxation.

The issue before the Supreme Court was
raised by the city authorities of Newark, who
took the position that the right-of-way was
taxable, and levied an assessment accordingly.
The railroad company protested and appealed
to the State Board of Taxation which sus-
tained the appeal, and ordered the assessment
reduced, asserting that "the trolley company
had no greater right in the street than the
traveler upon it, on foot or in the ordinary
vehicle; and that it therefore had no taxable
interest in the soil of the street."

The case was carried to the Supreme Court
of the State, which, as stated, ruled contrary
to this. The court holds that it must consider
the distinction between the franchise of the
company, which is taxable by the State for its
own purposes, and the property acquired by the
corporation to enable it to enjoy its franchise.
Such property is under law taxable by the
local authorities. The court adds that the
relation between the trolley company and the
public is different than that existing between
the trolley company and the abutting property
owners along the trolley line. As between
Newark and the company, "the latter has ac-
quired the right to lay in the soil the founda-
tions for its rails, to lay rails thereupon, and
the right to the continuous uninterrupted
occupancy of such part of the public estate.
Its poles and its tracks are there permanently
to the exclusion of any other person that
might desire to occupy the land, and during
the life of the grant the city of Newark will
be without the power to remove them. The
company has a grant of a part of the public
estate at its own permanent, exclusive use,

and that is an interest in real estate; the part must be of the same character as the whole."

Regarding the contention of the State Board of Taxation, quoted above, the court says that the assertion that a trolley company has no greater privilege in the highways than other travelers is in conflict with the evidence of one's sense. The court then asks "if the trolley company has no greater right than an individual, why do not all persons have the same right as a trolley company without a special grant."

The trolley companies have determined to carry the case to the Court of Errors and Appeals, and it is said the contest will be far more interesting than that before the Supreme Court, as a brilliant force of corporation lawyers will make the arguments. If the decision is sustained the corporations affected—and it will mean the steam railroads, too—will pay very large sums annually in taxes that they do not now have to pay.

* * *

The Charleston Exposition. Some one has aptly said that international as well as local expositions are becoming more and more recognized as important factors in industrial progress and the advancement of civilization throughout the world, and that the interest, influence and possibilities of these enterprises have increased and expanded in all directions, thereby increasing knowledge, creating honorable competition in the various industries of the United States. This is especially true of the electrical industry, for with every succeeding exposition greater advances are being made in the electrical field and manufacturers are finding it profitable to display their products before the multitude of buyers who always attend expositions and who are ever on the lookout for something new.

Just one month after the close of the Pan-American Exposition another enterprise, known officially as the South Carolina Interstate and West Indian Exposition, will be opened in the historic city of Charleston, S. C. This enterprise has been projected primarily to show the industrial development and vast resources of the Southern States and the natural products of the West Indies, and to bring into closer business touch the countries adjacent to the southeastern seaboard. Manufacturers are reminded that through the instrumentality of this exposition a splendid opportunity will be offered to extend the industrial and commercial relations of the United States so as to add to the territory already tributary to our manufacturers a still greater proportion of the West Indies and the Central and South American republics. These adjacent countries, with a population of over 50,000,000, offer an inviting field for the exploitation of American electrical machinery and appliances. Hitherto, Europe has had a large share of the trade of these countries, but the time has come to demonstrate that the ports of the southeastern states are the shortest and most direct, and therefore on the natural routes of commerce between all these countries of the Western Hemisphere and the interior states of the Union, and that by using these ports the manufacturers of the United States can compete with the whole world and secure pre-eminence in the commerce of the American continents.

Electricity will play a prominent part in this exposition, which will open on December 1,

1901, and continue until June 1, 1902. In the department devoted to electricity will be shown a complete display of electrical vehicles. A feature of the exposition that cannot fail to interest thousands of people will be a demonstration of the uses of electricity in the arts and methods of employing electricity in the household. Electric boats will ply upon the superb water-ways through the exposition grounds, and what is said to be the largest chime of bells in America will be run by electricity. To furnish power for operating purposes, a power house and generating plant will be erected between the transportation and machinery buildings, and a pumping station will be located close to the river front at the extreme northwest corner of the grounds. Electric light and power will be obtainable in all the buildings of the exposition and live exhibits in active operation will also be placed in every building.

Of late years, the South has rapidly come to the front as a manufacturing center and the use of electricity for various purposes is growing with equal rapidity. A good showing at this exposition by the electrical industry should be marked by still greater advances.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

MR. W. S. BARSTOW, general manager of the Edison Company of Brooklyn, has resigned.

A FASHION has been introduced in France of inviting friends to attend the christening of a new automobile.

GEN. A. W. GREELY of the Signal Corps is on his way to the Philippine Islands to inspect the submarine cable system and telegraph lines there.

LAST week the Lorain, O., Street Car Company put a three-cent fare in operation. The reduction from five cents is in the nature of an experiment. This is the first electric road in Ohio to carry passengers for three cents.

THE Technical School at Atlanta, Ga., is to have a new electrical laboratory.

A CABLE dispatch says that the General Electric Company has purchased the controlling interest in the British Thomson-Houston Company, which holds the exclusive rights in Great Britain for the Edison, Thomson-Houston and other patents.

WHEN the \$3,000,000 passenger station, that will be built in Chicago by the Vanderbilts, is completed, trains will be hauled in and out of the city by electric locomotives.

AT the recent session of the General Assembly, in Connecticut, not less than fifty special acts relating to street railways were passed. A large number of interurban trolley lines will be built.

THE New England Butt Company of Providence, R. I., has a new rotary machine for polishing electric cables. It is so designed that the pressure can be increased or diminished and has the advantage of enabling the operator to apply harder pressure than is safe when the machine is stopped. Speed also can be in-

creased and one machine can be used on various sizes of cables, while a second coating may be applied to the cable while it is being polished.

ACCORDING to a recent report from Paris the new French submarine boats building will be furnished with double motors—steam and electricity—similar to the fittings of the Holland, thus increasing their sphere of action and enabling them to plunge quicker than the Narval. The latter's recent experiments were unsatisfactory. The crew suffered greatly, and navigation on the surface was also defective.

REPORTS of dividends actually paid show that mining is the most profitable of all industries. Under the great improvements recently made in both air and electric drills, and the reduction of the cost of treating the ore by chemical processes, the large dividends already paid will be greatly increased. The waste dumps thrown away at the mines and mills a few years ago are now frequently treated at large profits.

A DISPATCH from Berlin says that experiments were made on Saturday with a new electric engine on the Berlin-Zossen Railway. The results justify the hope that it will be possible to make 200 kilowatts (142 miles hourly with the new engine.

H. A. EVERETT of the Cleveland Electric Railroad system will soon own the finest trolley car ever built. Exclusive of its costly furnishings, the car will cost about \$15,000. It will contain a parlor, library, workroom, dining room and kitchen, and it will also be fitted with three sleeping berths. The latter will be invisible during the day, because they will be stored beneath the floor of the car, not above, as is usual in most sleeping cars. The car will be nearly twice the length of the ordinary trolley car. At either end there will be an electric searchlight. The one at the rear of the car, being red, will turn on automatically whenever the car stops.

ACCORDING to a foreign contemporary the great Berlin Tramway Company offers prizes of 3,000 and 1,500 marks for the best speed indicators suitable for use on their tramways. Particulars of the conditions of the competition, and as to the additional royalty that will be paid by the company to the owner of the successful instrument, may be obtained from Die Direktion der Grossen Berliner Strassenbahn, 218 Friedrichstrasse, Berlin, S. W.

IN the immediate future there will be installed at the Illinois Central's fruit wharf, in New Orleans, La., by the United Fruit Company, an apparatus operated by electricity that will almost automatically unload the fruit vessels that bring their cargoes to that port. The machine is the invention of a Philadelphian, S. J. Sidney, and it will cost in the neighborhood of \$35,000 to erect. It will save nearly this much in the handling of bananas alone in a year, and will revolutionize that part of the fruit business. Incidentally it will dispense with the greater part of the Italian labor employed on the wharf. Now it costs the fruit importers 2½ cents a bunch for the handling of bananas. The machinery will cut this to 1½ cents a bunch. Last year 3,000,000 bunches were handled at this wharf, and the prospects are that the imports next year will be much larger. For the privilege of allowing the Unit-

ed Fruit Company to place in position this money saver the Board of Commissioners of the Port of New Orleans will receive \$600 the first year of its operation and \$1,000 each succeeding year.

EUGENE CHAMBERLAIN, Superintendent of the Equipment Department of the Brooklyn Rapid Transit Company, has invented a trolley car that he believes solves the problem of comfortable surface transportation. The seats are chairs of the type introduced on five cars put into commission on the road, but in this latest car Mr. Chamberlain has carried the idea further. Instead of being fixed in an immovable position the seats are arranged in pairs and are operated eccentrically from a base near the wall, one chair being directly over the base and the other at the end of a strong iron member, which revolves from the base center.

NOTICE has been given by the British Embassy in Washington, D. C., of an important test at which it is expected American inventors will enter next December, of horseless vehicles for the British army. These prizes of \$2,500, \$1,250 and \$500 are offered by the British War Office for three self-propelling "lorries" best suited for military requirements. The "lorry" is a vehicle for the transportation of freight, and is of a special pattern to facilitate the handling of merchandise of all descriptions. The vehicle is to be capable of use on rough roads and to a limited extent, across country; to have a capacity of three tons on the lorry and two tons on a trailer. The maximum speed is to be eight miles per hour, and the driving wheels must not be less than 9 inches across the tires. No restriction is placed on the kind of fuel or class of engine, steam, internal combustion or otherwise. War Department officers who propose doing something in the same line believe the question is entitled to a great deal of consideration. The few horseless carriages the army now uses, have been performing good work, but there is reason to believe that they should be of a different type and better adapted for army purposes.

THE new electric elevator in the Washington, D. C., Monument was tested last Thursday for the first time since its installation. For two weeks it will make many trips daily to the top of the great shaft, weighted with 5,000 pounds of sand. If it continues to make the trips without accident at the end of the fortnight, it will be opened to the public and visitors will no longer be obliged to climb the thousand steps to reach the top. The new lift is a handsome bronze trimmed cage, fitted with leather cushioned seats for thirty passengers. It has a counterweight of 8,000 pounds, so that considerable more power is required to bring it to the earth than to raise it to the top of the monument. The best safety devices known are provided, and unless all six of the strong steel cables should break at once, an almost impossible contingency, a serious accident is out of the question.

THE French Government has appointed a commission to study the possibilities of using the earth's strata, instead of air, for transmitting messages by wireless telegraphy, M. Villot, inspector-general of Posts and Telegraphs in France, and head of the commission, said in a recent interview: "Aerial wireless

telegraphy cannot give entirely satisfactory results, as experiments have been proved to vary with the atmospheric conditions. Furthermore, the horizon remains an insurmountable barrier for long-distance messages, even with relays. On the contrary, certainty can be obtained in pouring into known subterranean layers sufficient power to reach a desired point, where perfected apparatus will receive the message. The first duty of the commission will be a thorough study of the earthly strata, which the latest geological researches have shown to be imperfectly understood."

THE *Lucania* of the Cunard line, which reached this port last Saturday from Liverpool and Queenstown, experimented with the Marconi system of wireless telegraphy on her voyage over. Going down the Mersey she exchanged aerial greetings with the British schoolship *Conway*, which is equipped with the Marconi apparatus. She also swapped salutes with wireless telegraph stations on the Irish coast, and while at sea swapped sentiments with the Elder-Dempster liner *Lake Champlain*, also fitted with a wireless system of communication. Many passengers sent messages to their friends ashore by way of stations on the Irish coast.

THROUGH what appears to be an official statement, it has been learned that the Brooklyn Rapid Transit Railway Company intends spending at least \$3,000,000 for improvements on the elevated and surface lines. A detailed statement of how the money will be spent reads: A power house at Third avenue and First street, \$308,305; equipment for this plant, \$1,283,470; subways for feed wires, \$533,071; tracks and roadways, \$173,128; engines and generators, \$600,000; new construction, \$285,000. Grand total, \$3,182,974.

THE question of providing the British cavalry in South Africa with remounts has apparently had the effect of sharpening the wits of some of our legislators, says the "Electrical Engineer," London. In the House of Commons, for instance an hon. member hit upon the brilliant idea of substituting motor-cars for horses, observing the while that they could go into places where horses could not proceed, that they could move faster and carry heavier goods. A charge of cavalry mounted on motor-cars would certainly be something more than unique, and the spectacle of mounted Boers being pursued over kopjes by motor-cars brought forth some jocular remarks from the members assembled. Later on, however, it was stated that the Government is alive to the importance of motor-cars for transport purposes, and is now conducting experiments with a view to their utilization in the army.

Convention of the Association of Railway Telegraph Superintendents.

The annual convention of the Association of Railway Telegraph Superintendents opened in Buffalo, N. Y., at Statler's Hotel, near the Exposition grounds, last Wednesday, with about 150 members of the Association in town for the first day's session.

W. F. Williams of Norfolk, Va., president of the Association, called the convention to order at 10 o'clock. The officers and various committees submitted their reports and they were accepted and then various matters of especial

interest to railway telegraphers were taken up and discussed.

Among the papers read were the following: "The Application of Storage Batteries to Railway Telegraph Service," by W. E. Athearn of New York; "Rapid Telegraphy," by Walter E. Phillips of New York, in whose absence the paper was read by John Ghegan of New York; "Cipher Code for General Railway Telegraphy," by C. S. Rhoads of Indianapolis; "The Voltaplex," by Charles Selden of Baltimore; "The Inefficiency of the Ordinary Operator and How to Remedy It," by A. R. Swift of Chicago.

The following officers were elected: President, C. F. Annette of Chicago; vice-president, F. P. Valentine, Boston; secretary and treasurer, P. W. Drew of Milwaukee.

The Association chose Boston as its meeting place for next year.

LONDON NOTES.

(From our London Correspondent.)

English Municipal Electrical Engineers in Convention.

Members of the Municipal Electrical Association betook themselves to Glasgow for the opening of their annual convention on June 19. The president for the year is Mr. W. A. Chamen, the chief engineer of the Glasgow Corporation Electricity Supply Undertaking, which has recently undergone such large extensions. His presidential address was followed by the reading of half a dozen papers on matters of pressing importance to municipal electricians, these being distributed over the three day's proceedings. The topics selected were:—(1) Uninsulated Returns in a Tramway System; (2) Street Electric Lighting; (3) Braking Apparatus for Electric Cars; (4) Equitable Allocation of Costs in Combined Lighting and Traction Stations; (5) Refuse Destructors in Combination with Electric Power Stations; (6) Coal and Ash Conveying gear. Anyone who has recently followed the course of events in connection with municipal electrical works in England will at once recognize in these subjects matters which are uppermost in the minds of borough electrical engineers and electrical committees.

Institution of Electrical Engineers.

The Institution has now finally elected its president for the year in the person of Mr. W. Langdon, whose work in connection with the applications of electricity to railway working dates back many years. The list of awards for papers read at meetings held during the past year has been issued. The awards vary in value from £5 to £25, and the papers are: "Insulation on Cables," by Mr. O'Gorman; "Rapid Variations of the Current Through the Direct Current Arc," by Mr. W. Duddell; "Notes on Polyphase Sub-Station Machinery," by Mr. A. C. Eborall; "Storage Batteries in Electric Power Stations Controlled by Reversible Boosters," by Mr. J. S. Highfield; "Method of Compensating Voltmeters for Voltage Drop in Large Feeders," by Mr. M. B. Field; "Polyphase Equipment of Factories," by Mr. W. Wyld; "Electrically-Driven Machine Tools and Their Advantages," by Mr. G. Ralph; "A Watt-Hour Meter," by Mr. F. Holden.

Electric Traction on the Underground.

The latest information about this matter is to the effect that a new company has been formed to carry out the electrification. It is called the Metropolitan District Electric Traction Company, and will lay the permanent way, provide new rolling stock, and erect the necessary power station at Lot's Road, Chelsea. "Undecided" is still the only news available regarding the electrical system to be employed.

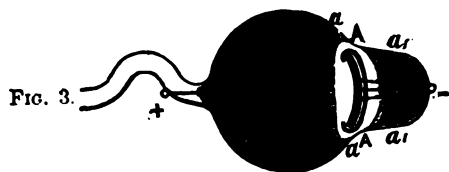
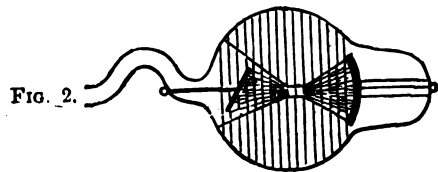
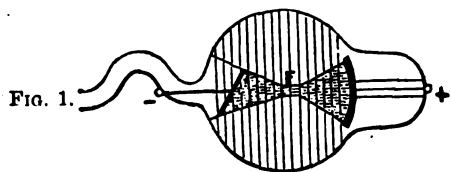
ON ANODE RAYS.*

BY W. HIBBERT.

About three or four years ago, Dr. Gladstone and I conducted some researches on the absorption of X-rays by various salts and metals. The experiments were very numerous and involved the use of many tubes, so that incidentally a great variety of observations were made. In some cases, pure accident led to some notes about anode rays which may interest your readers. M. Sagnac has given some account of similar results.

The X-ray tubes employed were of the well known form shown in the figures, the bulb being about 2½ in. in diameter, and the distance from the aluminum cup to the platinum plate about 1½ in.

For the benefit of those who are less familiar with the subject, it will be convenient to describe the appearances observed during the process of exhausting these tubes, when an electric discharge from a coil is used. At a pressure which is relatively great, light appears around the cathode cup (Fig. 3). With increasing exhaustion this light spreads more and



more till a converging beam forms. The focus of this cone has a very considerable depth, but divergence over a large area follows (Fig. 2). As the pressure still diminishes, the divergence cone narrows, until it all falls on the flat platinum plate. At still further exhaustion these cones disappear, and the greenish-yellow light which indicates the X-ray stage fills the whole space intervening between the electrodes. At various stages, the platinum plate (anode) is observed to get red hot, which is explained by the action of "cathode rays" from the aluminum cup bombarding the plate on which they are focused, raising its temperature by delivering up to it the kinetic energy they possess.

While at work on these tubes, I had the good fortune to see the result of an excessively small puncture, so small, indeed, that the normal pressure was not restored in six hours. The main effects observed were the reverse of those just described as occurring during exhaustion. The greenish-yellow light disappeared; the fairly concentrated cones were followed by the more diffused; and after a little while, light could be seen round the aluminum cup only.

In this deteriorating vacuum I happened to reverse the current, just after the cones had disappeared, and the focus was becoming in-

definite. The aluminum cup thus became an anode, and the platinum plate a cathode, contrary to the usual practice. To my surprise, the platinum cathode became red hot, and continued so during the discharge. Even when the battery was switched off, the incandescence was visible, dying away in a manner observed after bombardment by cathode rays. The current was reversed six or seven times, and each time that the platinum plate was acting as cathode it became red hot, though this was not observed when it was made an anode.

It is now granted that the ordinary incandescence of an anti-cathode, or anode, is due to bombardment by "rays" from the cathode. Parity of reasoning suggests that at the particular pressure reached in the experiments just described the cup-shaped aluminum electrode can radiate anode rays more energetically than cathode rays.

As the leakage continued and the vacuum deteriorated still further, the visible heating of the platinum plate (cathode) diminished and finally ceased. But heating continued for the bulb was found to be warm over a considerable area near the cathode. At a pressure at which the discharge showed light just round the alu-

and irregularly distributed till a much lower pressure is increased. The bombardment is then concentrated on the cathode as described raising it to incandescence. The pressure at which this was obtained was proved in various experiments to be just higher than that at which the "focus" becomes visible. In some experiments the platinum was seen to heat first at a point or a very small area, recalling the experimental proof given by Mr. Campbell Swinton of a focal concentration continuing to the anode. Here, of course, the continuation is to the cathode.

These results seem to indicate that during exhaustion of a tube there are both anode and cathode rays, that the line of discharge and concentration for each varies according to the pressure, and that at particular, though different, pressures, it is possible to get convergence of either.

BECKENHAM ELECTRICITY WORKS.

BY FRANK C. PERKINS.

Among the London and Greater London stations recently constructed and now in operation there are several which are of interest to engi-



BECKENHAM ELECTRICITY WORKS STATION.

minum cup as cathode (Fig. 3), the current was reversed, and the heating effects were greatest at A A, falling rapidly in front to a a, and less rapidly behind to a₁ a₁.

I now tried to obtain evidence of this anode radiation, and consequent incandescence of the cathode, during the process of exhausting a tube. Putting a tube on to a Cossor pump, and running steadily until an ill-defined "focus" appeared between the electrodes (the discharge being in the usual direction—aluminum as cathode, platinum as anode) the current was reversed, and at once the platinum plate began to glow. Here again the anode radiation or discharge is more energetic than that from the same end used as cathode.

Some observations were made during the process of exhaustion by touching different parts of the glass globe. Heating effects were observable over a wide range of pressure, and as soon as the vacuum became fairly good, the temperature was higher round the cathode than near the anode. It is, however, widely

neers in this country and well worth considering at greater length than is possible in a short descriptive sketch. The electricity works of the Beckenham District Council began operations last fall on November 23. The engineer-in-chief is A. J. Hedgecock and the consulting engineer R. P. Wilson. The station is located at Arthur-road, Beckenham, England, and cost nearly \$200,000, of which the buildings with the destructor cost \$60,000 and the machinery, mains and transformers \$125,000.

The system used is an alternating one, the frequency being 50 cycles; a three wire net work is employed, the transformers being placed in nine substations located above ground, and converting the current from 2,000 volts to 400 and 200 volts.

The boilers are three in number, each evaporating 3,700 lbs. of water per hour at 160 lbs., and were constructed by the firm of Babcock & Wilcox. The engines are of the Baliss and Morcom compound type, two having an output

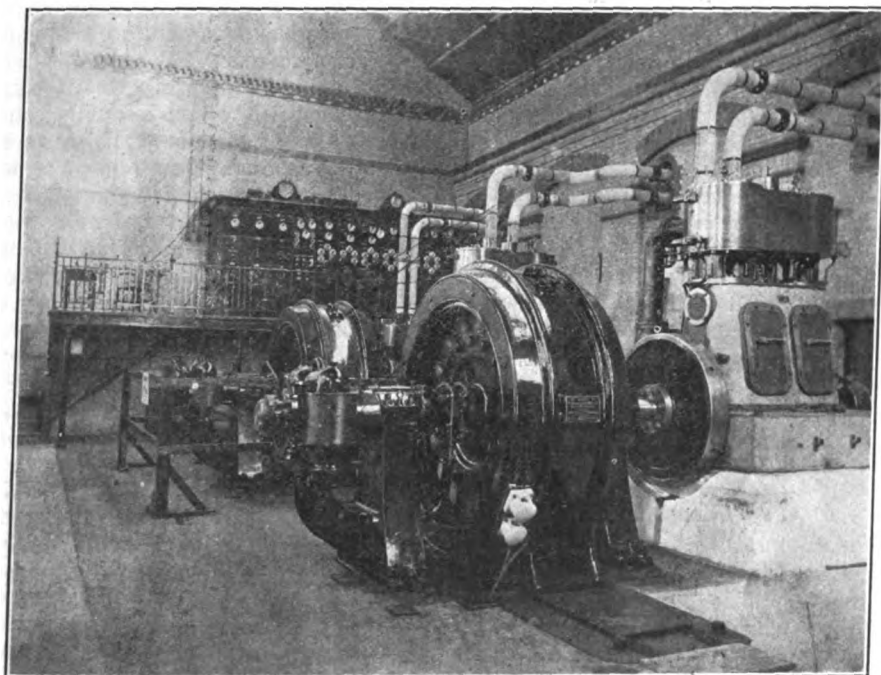
*From the "Electrical Review," London.

of 200 hp. each and one of 100 hp. capacity. The engines, as noted in the accompanying illustration, are of vertical construction and are each directly coupled to alternators of Fowler & Co.'s design, two being of 120 kilowatts and one of 60 kilowatts' capacity.

The speed of the larger sets is 380 revolutions per minute and the smaller outfits run at 500 revolutions per minute, generating an alternating current of 2,000 volts at 50 cycles per second.

The mains were supplied and laid by the B. I. W. Company, of Prescott, Lancashire, and are concentric cables, lead covered, and laid in earthenware troughs filled in with bitumen.

The public lighting is done by 18 ampere arc lamps in parallel on 200-volt circuits, while the incandescent lighting is operated on the three-wire system, 8 candle power lamps being largely used, a total of 13,500 lamps being connected up May 1, 1901.



BECKENHAM ELECTRICITY WORKS ENGINES.

Thompson-Houston meters are used and the price per unit is 6d. for lighting and 3d. for power service, the price of gas in the district being 2s.10d. and supplied by two local companies.

This station is used in conjunction with dust destructors. They were built by the Horsfall Destructor Company of Leeds, and consist of three cells, each capable of destroying 10 tons of refuse per day, and when working at full power will generate steam enough for a load of 60 kilowatts.

The Green economizer is of the 96 tube type. Natural draught is used, but a Horsfall steam jet is employed for the destructors. Hand stoking is employed and Evans ram pumps are used, the water supply being from artesian wells and also from town water. The free wiring system is utilized at this plant.

Recent news from San Francisco, Cal., states that at the regular monthly meeting of the board of trustees of the Chamber of Commerce the proposition of establishing a Marconi wireless telegraph system to the Farallone Islands was brought up for discussion. The board finally decided to confer with the United States Weather Bureau in the matter.

BELL METHODS.*

BY E. B. FISHER.

I do not expect or hope to say anything startling or novel. Most of you already know all that I shall mention this morning—have had experiences and observations similar to those mentioned; but to recall them may induce the presentation of other and really new experiences, and may prove an encouragement or a suggestion to those just entering or about to enter the Independent telephone field. The man or corporation that should ignore competitors, that fails to study their mutual condition, and profit from them, could not expect to succeed in competitive enterprises and efforts. The man or corporation that maliciously or falsely discusses a competitor and its business in the hope that thereby its own business may be benefited makes a grievous mistake, and in the end loses more than is expected to be

rather than from profitable observation of what had already been "threshed out" in the evolution of the Bell system. It is highly essential, now that the Independent systems are becoming larger, more complex, and intimately related with each other, that thorough system shall obtain; that first-class construction shall be the rule rather than the exception; that uniformity of practice in the manner of toll service, in the division of revenue arising therefrom shall obtain; that those conducting the business shall exchange experiences, thus enabling all to learn of mistakes and avoid them, and to secure the advantages of improvements that may be devised. The exchanges of the Bell Company throughout the country have for years enjoyed the interchange of opinion and experience, and through the manifest advantages of such interchange have avoided many difficulties and secured many betterments. We can and should copy this feature. We should meet each other frequently, individually and collectively, and should keep in touch with each other by correspondence as well as over the wires—when we hear of a good thing, let our neighbors know of it; when we discover perils or uncomfortable conditions, warn our friends. The Bell, in a sense, although composed of many subordinate companies, have been one family. We can retain our individuality, maintain our ambitions to be the first in our chosen sphere of action, and still remember that we are a part of a family. Some have been inclined to suggest that our friends of the Bell Company had too much system. As the business develops it begins to appear that too much system is less expensive and less foolish than too little. If the managers and operators of Independent plants shall more carefully and fully analyze the cost of conducting their business in the different departments and the results therefrom, many errors will be avoided and the ledger balance on the right side will unquestionably grow. In systematizing business, we have much to learn from Bell methods. We should gain this knowledge and improve on it.

It is undoubtedly true that the conduct of a monopoly often results in somewhat of arrogance on the part of those who are at the head of such monopoly, or who hold responsible positions in the management of its business. Such people naturally come to feel that they can do about as they please, and if patrons or the public are not delighted therewith, what odds. I have heard gentlemen, who are listeners to this paper, more than once offer the suggestion that they would not care for the service of certain Bell employees who had applied for positions, because they were too "cranky." We can see for ourselves how natural it was that crankiness grew upon many officials and managers of Bell plants. They were not obliged to consult the wishes or desires of the public to secure their business and profits. One could take telephone service on their terms or let it alone. That was all there was of it.

This spirit of crankiness, so natural under the circumstances which engendered it, is the exponent of general conditions which produced other peculiar manifestations often noted the past few years. We should carefully consider these manifestations which are intended or expected to affect our own business, and, by interchange of observations or experiences, help each other and counsel or warn those who are about to engage in the Independent tele-

*Paper read at the meeting of the Independent Telephone Association, Buffalo, N. Y., June 18, 1901.

phone business. I well remember when, a little more than six years ago, we began canvassing in Grand Rapids, Mich., to secure the money with which to build the plant of the Citizen's Company and for patrons of the same, the many stories which were afloat among our people as to our business. It was confidently asserted by representatives of the Bell Company in our city and State that we never would build a telephone plant, indeed, that we had no intention of so doing, and were only trying to make money by being bought out. We were, in effect, intimidated, intending blackmail. It was said that we could not build, could not get material, could not properly combine the material when we got it, could not find apparatus that was not infringing, could not get a switchboard that would work, would not know enough to set poles, string wire thereon and make them stand up. Even after we had actually begun to install telephones, those who had given us contracts were prompted to bet that we never would give service. There were infringement suits, which may have been really expected to put a quietus on our enterprise, but these did not any of them succeed—it scarcely seems possible that some of them could have been expected to.

We have been giving service for more than five years, and the company which was then organized with but \$100,000, authorized capital, has grown until it has to-day more than one-half as many telephones as the Bell had in the entire State of Michigan but five years ago, and has an authorized capital well toward one-half what the Michigan Telephone Company then had. And yet to-day similar predictions and commentaries upon like enterprises, even in Michigan, as well as other States, are indulged in by our neighbors. Officials of the Erie Company have informed the public through the press within a few weeks that the new Independent plant will never be built in Detroit; that the People's Company in that city never will give service. When, in your respective localities, the Bell resorts to such methods to dissuade the public from patronizing them, to persuade them that you are not intending genuine business, you can comfort yourself with the fact that you are not singular in this experience, and you can point to results in other localities and say to your friends, "It is an old story, and no truer here than it has been elsewhere."

If you get started with service and you find that your patrons receive circular letters suggesting that the Bell is owner of letters patent "steep hundred thousand and steep," and that all who use the Independent apparatus infringe such letters patent and are liable to prosecution for using the same, do not flatter yourself that in this method the Bell Company is distinguishing you beyond other Independent companies. Such things have been done repeatedly. You have yet to hear of a subscriber who has been so prosecuted, and you can very safely guarantee your patrons against any damage that may be awarded by any court under such suits, and that you will pay all costs for defense. If you should find that the Bell Company, which has frequently informed the people in your community that its former rates were the lowest they could afford to make for its service in your locality, has, upon the development of your competition, resorted to free service, or much less than cost rates in an effort to destroy you, do not be fearful that such practice can really damage your company;

do not imagine that you are enduring an experience novel in the telephone business. No, not for a minute, when the Bell resorts to this method attempt to meet competition by establishing like rates, or lower rates, for your own service. Begin the education of your people, take them into your confidence, tell them the truth about your business and its results; insist upon a fair profit, upon reasonable returns on the actual investment, after giving good service, and you will find the people ready to pay your price rather than to get absolutely free service from the competitor. Do not resort to other tactics, because there can be but one result from such procedure. This Bell method is a "war measure," pure and simple, and if it could succeed would be followed by such advance in rates as would fully compensate that company for the temporary concession of free service or less-than-cost rates. This fact has but to be stated to intelligent business men to be apparent to them, and to influence their action. This method, which has been practiced by the Bell subordinate companies in considerable regions of the country, so far as I know, never yet has succeeded in taking away the patronage of an Independent company honestly striving to give good service at a reasonable rate. The company which shall reduce its rates below a reasonable point in a struggle with the Bell Company is doomed the moment it shall do so.

What do you think of party-line service? One of the methods of the Bell Company, in its efforts to meet the lower rates of Independent telephone companies, has been to introduce, quite largely, party-line service with important reductions in rates for such service. Has it been successful where you have observed it? Is it a serious menace as a competitor? Of course, we know that the new president of the Central Union and the Chicago Telephone Companies, who still retains his position at the head of the Pacific Coast Company—all Bell—is a staunch advocate of this sort of service. He is a gentleman of extended experience and wide observation in telephony, and for that reason his opinion is not to be lightly dismissed or treated with indifference. We are this morning discussing Bell methods in the hope that we may learn from them and profit from either accepting or avoiding their example. My own observation has been that party-line service is largely "a snare and a delusion," where given in city exchanges, and is not a competition that we need fear. It is evident that no devices have yet been invented which will permit more than two parties to use the same line at the same time, so when any pair on a party-line holds the line, others must wait. Should this sort of service be generally used, the difficulty of securing your own line and of getting connections with other parties on similar lines is manifestly very greatly increased. We all know how impatient the average telephone user is to get service the moment it is wished—you have known subscribers ready to swear that the girl kept them waiting two minutes for a connection when it was not to exceed 20 seconds. I do not believe that you will be compelled to resort to party-line service to meet this method of the Bell competition. The B. W. C. service, which was expected to work wonders three or four years ago, is not very generally popular.

No discussion of recent Bell methods would be useful if we did not consider minute rates

for toll service. What is your observation on this topic? The high authority from the Pacific Coast who is trying to stifle competitors in the Central Union territory and to prevent it in Chicago, who is indeed regarded as a possible head of the American Telephone and Telegraph Company, is the father of the minute-rate service. He sets great store by his scheme, and has secured its adoption in considerable territory outside of that which he controls. We, in the Michigan territory, find it one of our competitions, and have not quite made up our minds as to its present and probable effects. However, on general terms, it is fair to state that it is causing considerable friction and dissatisfaction. The average telephone user is ready to affirm that he has not used the service so long as he has been charged for. He considers himself a victim of overcharge and believes that the minute-rate is intended to thus increase the fees of the telephone company which he was inclined to believe were already quite large enough. If the average business man, on a long distance connection, can actually accomplish his conversation in a single minute, it strikes me that at the price for one minute's connection, the line cannot earn enough, for we all know that quite as much time heretofore has been spent in getting two parties to talking as is occupied with their conversation. Now, if the time for securing connections cannot be reduced and the time of using is reduced, with theoretical reduction of pay, service would be less profitable to the companies than on the three or the five-minute basis. If the average subscriber is expected to use the line on a three or five-minute basis, why not make rates upon that theory? That would be fair to both companies and patron, and secure the desired revenue, even if but one minute should actually be used. The purpose of this paper, as before intimated, is to set you to talking about your mutual experiences and to induce discussion rather than to state conclusions.

In Michigan our neighbors have taken a new departure within the last few weeks. Formerly, they refused to admit that any other apparatus than the Bell could be successfully used in telephone service. The sub-companies of the parent company were supposed to have a hard and fast contract forbidding the use of any other apparatus, and forbidding connections with any other apparatus. Lately the Michigan telephone companies have been attempting to secure, in a few instances, toll line alliances with companies formerly built and still continued, as far as exchanges are concerned, as Independent companies. The Michigan company has said, in effect, to such companies: Keep your local exchanges, even your own toll lines; take control of the exchange business in your locality, but enter into a contract for toll connection outside your territory through the Bell system. It will give you equal percentages on originating business to those you have heretofore enjoyed, and provide you with more extended and superior toll line facilities. This late Bell method is insidious, and it is not strange that in some cases it is successful. Where such a contract is made exclusive—and, of course, they try to make it exclusive if possible—it subtracts by so much from the efficiency of adjoining or neighboring Independent service. So anxious has the Michigan Telephone Company become in this matter, I believe it is true that it has been willing to make arrangements in some cases

for a divided toll service where it was impossible to secure an exclusive contract. This Bell method is one of the most threatening efforts yet made, and yet has its silver lining. The strong Independent companies, with considerable toll line facilities which have been growing, have not been influenced by such propositions. Only the smaller and weaker companies have made such contracts with the Bell Company. Of course, no other Independent company has been willing to parallel the lines of a neighboring Independent company, no matter how inferior might be such neighboring plant, or how imperfect its service. Now that sort of territory will be provided with up-to-date Independent plants. This recent manifestation would seem to indicate that the parent company must have consented to an abandonment of the exclusive feature of its contract with subordinate companies.

I believe that the Bell habit of ignoring the farmers—the small villages and the country—has been an error. I think that in this department of telephone service, a proper development of party lines may be made with great advantage to the communities served and at fair profits to the investor. There are regions in Michigan—and probably each of you could repeat the same tale—where the Bell is beginning to compete with Independents in their own field in this regard. I say their own field, because the Independents were the first to deliberately provide this sort of service. This Bell method of following a good example may prove a formidable competition, and may materially strengthen their smaller exchanges and their situation if they shall first enter new territory with this sort of service.

There was a time when I think it was actually believed by the average general manager or prominent official connected with the Bell telephone companies that an Independent company could not possibly secure intelligent, experienced employees. They thought that we would be compelled to go through the process of evolution which was so tedious and so costly in the earlier days of the Bell Company; that their employees would remain with them. They even thought in some localities that an Independent company would not get exchange operators, and in some instances employed superfluous help simply to keep them from entering the service of Independent competitors. Some know more to-day on this topic than they did a few years ago.

A large number of the brightest men in telephony have found employment in the independent field, and there is scarcely one in this Convention Hall who has not had frequent opportunity to secure many more of the most important employees of the Bell Company than he has had places for. We have been surprised at times at the seeming lack of loyalty to their employers by those who have been so long on Bell pay-rolls. Perhaps a little analysis of Bell methods may explain this situation and furnish a warning for ourselves. The rewards among the employees of the Bell heretofore have not been great either in salary or opportunities. They have been made to feel more like machines than human beings. In many cases they have not had their inventive tendencies encouraged by proper compensation for what they produced; indeed, they have been compelled to part with their inventions on the theory that their brains as well as their labor belonged to their employer, or because

there was but one market for their invention and devices. That market could set its own price upon what it bought. Such conditions are not conducive to loyalty, or to inducing energetic service. The Independents, if they shall copy Bell methods in this respect, will make a grievous mistake. If you should wake up some fine morning and hear that you have sold, or are about to sell, your telephone plant to the Bell Company do not consider that the transaction is necessarily closed. If you hear similar reports as to actual or impending sales of other Independent companies in your own or other States, be not disturbed thereat, nor convinced that the news is reliable. There have been some such sales, but vastly more rumors of those which never have occurred and do not seem likely to. There have been methods in these rumors. For some reason, some interest, evidently not Independent, has believed it desirable to circulate such reports, probably in the hope that other Independent interests might be disquieted or discouraged, and yield more readily to apparently advantageous offers. These methods have been relied upon to produce serious effects. Keep yourself and your neighbors advised of the strength and growth of the Independent movement, of the strength of their own situation in competition, and fewer such rumors will be verified hereafter.

In nothing that I have said thus far have I given many of you real news. As I said to one of my friends, I felt that it was impossible to do so, and was almost ashamed of having tried to prepare and read such a paper; but if it shall refresh your memory, if it shall induce you to give other experiences and observations of your own; if it shall attract, through publication in our annual reports or otherwise, the attention of any who are about to engage in the telephone business, and shall hearten and strengthen them in their enterprise and efforts, it may accomplish some of the good earnestly desired and intended in the preparation of the paper. As stated at the outset, it is not in criticism or derogation of the Bell Company that is offered. That corporation has the right to resort to any efforts within the bounds of fact, it may choose to make, and we have equal right to discuss its methods and by considering them, minimize their effect, if not entirely to overcome them.

A NEW PHONOGRAPHIC PRINCIPLE.*

BY W. NERNST AND R. VON LIEBEN.

As is well known, the Poulsen phonograph has in recent times excited well deserved attention, not only because of its absolutely pure reproduction of human speech, but above all because of the originality of the idea on which the apparatus is based. Instead of employing, as Edison did, soft masses to fix the tones by means of mechanical deformations produced by the sound waves, Poulsen uses the magnetic effect of the microphone current upon a magnetically-deformable substance—steel. It is evident that one can, in general, employ on the phonographic principle any process which will produce a lasting change proportional to the corresponding action of the voice. One might conceive an electrification of insulators (which would be, so to speak, an electrostatic analogue to the Poulsen electromagnetic ap-

*Translated by the "Electrician," London, from the "Zeitschrift für Elektrochemie."

paratus), a photo-chemical process, etc. The electro chemist will, in the first instance, however, bethink himself of the permanent change which an electric current produces in an electrode, i. e., galvanic polarization. The following experiment may therefore be made (Fig. 1): An endless belt of platinum runs over two rollers, and is continuously moved by a motor and polarized by a microphone current. As a necessary condition is that the variable polarizations produced by the current variations must be separate from one another in position, the platinum belt must move with considerable speed on the one hand, but on the other hand, the contact surface between the belt and the electrolyte must be as small as possible. The latter condition is sufficiently fulfilled if one employs as an electrolyte a wooden wedge which is saturated with a conducting liquid held in a glass trough provided with an electrode. In the figure, M is a microphone which is connected in the primary circuit of a transformer, in which circuit are also five accumulator cells. S is the secondary coil of the transformer. For receiving the record the throw-over switch W connects the apparatus with S, and for reproduction connects it to the telephone T. B is a battery of variable pressure which can, if required, be connected in the circuit. The experiment succeeded

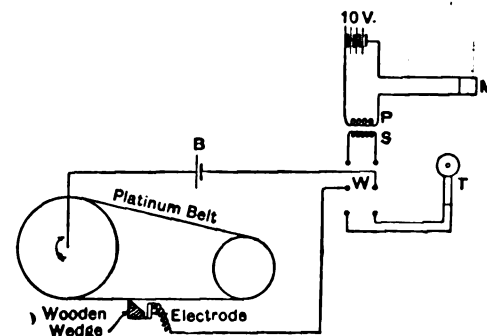


FIG. 1.

completely. One heard a more or less clear reproduction which could be repeated several times before the volume of sound had noticeably diminished.* However, the quite unexpected result was easily remarked that for reproduction it is necessary to have a current in the telephone circuit, and that, at least within certain limits, reproduction is louder the stronger the current is. To regulate this current a variable EMF. can be connected into the secondary circuit. Evidently this phenomenon is not compatible with the idea that the currents reproducing the sounds in the telephone are nothing but discharge currents from a polarized electrode. Such a discharge would naturally have to occur when no permanent current was flowing, and the superposed permanent current would have no influence on it. The assumption that the variation in resistance or contact resistances of the polarized platinum belt caused the effect would certainly agree with the above-described behavior. For these would naturally require a current to make the variations in resistance active, and the volume of sound would necessarily, as had been observed, increase with the value of the constant current. The following observations, however, make this explanation questionable.

*The above-described experiment had been already made by me in June of last year; without knowing of this, Herr von Lieben suggested to me soon afterwards the making of a phonograph based on the variations in resistance which could be produced by the electrolytic deposit of films of oxide or the like on metal electrodes. Thereupon we continued the investigation together.—W. NERNST.

It is difficult to assume that hydrogen or oxygen polarization on platinum would cause noticeable variations in resistance. Besides a very strong action is also noticed in employing a solution of silver-potassium cyanide and a moving strip of silver, in which any variation in resistance is certainly not to be expected. We would put forward the following explanation as most probable: Variations of the microphone currents cause a superficial disintegration of the metal electrode passing through the electrolyte. According to the amount of this disintegration, which would naturally be accompanied by a change in the polarization capacity, variations in the constant current would occur on reproduction, which would be reproduced as sounds in the telephone. Although, as already remarked, in some cases a really clear and sufficiently loud reproduction of spoken words occurs, we believe, nevertheless, that the above-described arrangement would not afford any practical utility on account of its frequently uncertain behavior, and also for other reasons.

ADDITIONAL NOTES BY HERB ROBERT VON LIEBEN.

As a continuation of the experiments contained in the above article, I have tested other metals than the above-mentioned platinum in

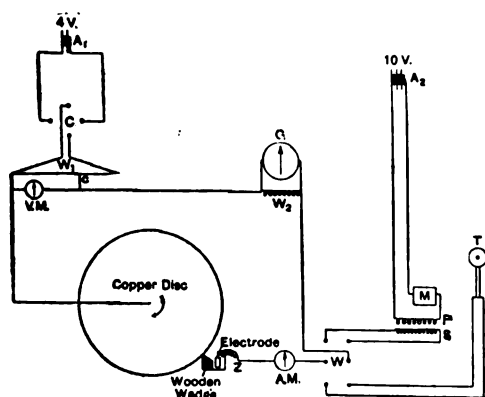


FIG. 2.

their applications to an electro-chemical phonograph. The frequent tearing of the platinum belt, in consequence of the continual bending, disturbed the observations, as did also the joint in the belt. So it was necessary to try another arrangement. The following showed itself suitable:

A copper disk, about 2 mm. thick and 450 mm. diameter, screwed between two strong cast-iron plates, rotates on a pivot bearing. Parallel to the cast-iron plates a second driving disk, also of cast iron, is keyed. This is driven by an india-rubber friction pulley at the end of the shaft of a small electromotor. By moving the electromotor on slide bars at right angles to the axis of the copper disk, the friction pulley can be made to drive the cast-iron disk either near its center or its periphery, so that different speeds can be given to the copper disk. The edge of the copper disk is carefully turned up, and current may be led to it directly through the pivot bearing. The other electrode is in a small glass trough, measuring about 20 x 5 x 10 mm., in which also is the wooden wedge (beech or cane) which is saturated with the electrolyte. It was found advantageous to connect the trough with a weak spring, so that the point of the wooden wedge is gently pressed against the periphery of the copper disk. The latter is about 3 mm. wide, and the width of the contact of the wedge about 1/4 mm. The smallest speed which could

be employed for clear reproduction was about 60 revolutions per minute, and the purity of the tone increases as the speed increases. There was easily room for one or two words on the periphery of the disk. In order to prevent disturbing noises it was necessary to insert a pad of blotting-paper or similar material, soaked in the electrolyte, which pressed gently against the periphery of the disk. This prevented the crystallization of the film of electrolyte, as it passed through the air, without moistening the periphery too much.

Fig. 2 shows diagrammatically the connections employed, these being almost exactly as in the previous experiment. A resistance W_1 is added, however, with a sliding contact c , which enables the EMF. of the trough to be compensated so that the null instrument G indicates no current. In making the record the current takes the following path: From the accumulator battery A_1 it flows to the switch C , a part going through the resistance W_1 and the voltmeter VM , and part through the periphery of the copper disk, and thence through the saturated wooden wedge to the electrode. From here, through the ammeter AM , the mercury contacts W , then through the secondary coil S , again through the contacts W to the null instrument G , the sliding contact c , the switch C and back to the battery. If the sound is to be reproduced, the connection to the mercury contacts is changed, so that the current flows through the telephone T . While recording, the battery A_2 sends current through the microphone M and the primary coil P . Induction currents are therefore produced in S which are superposed on the constant current of the battery A_1 and vary its value. The ratio of transformation P to S is not unimportant. As the result of trials the best was found to be 1 : 80. Many experiments were not made with regard to this, but there must be a certain best ratio. The resistance of the microphone and telephone was taken as small as possible. It was found to be a decided disadvantage to connect the microphone directly into the circuit of the battery A_1 , as, on account of the disturbing noises which take place with a high current density at the contact surface of the wooden wedge (due to interruptions through bubbles of gas, etc.), this would necessitate too small a value for the current in the microphone for it to work well.

SUPERHEATED STEAM.*

BY ERNEST H. FOSTER.

It often occurs that a mechanical improvement attracts more or less wide attention for a time and then falls into disuse, even to the point of being almost forgotten, because of some apparently insurmountable obstacle, to be taken up again at a later date when the conditions governing its use appear to be more favorable.

This seems to be especially true with the subject of superheated steam, by which we mean the practice of raising steam, immediately after its generation in the boiler, to a temperature considerably in excess of the saturation point, without greatly increasing its pressure, for the purpose of working it in a steam engine in this condition.

Considerable attention was given to this subject as far back as the year 1850, when we find numerous reports of engine tests which show

*Paper read at the Milwaukee meeting (May 28-31, 1901) of the American Society of Mechanical Engineers.

most remarkable gains, ranging from 30 per cent. to 40 per cent., of work done with a given amount of superheated steam over the same weight of steam at a temperature corresponding to its pressure. These early experiments seem to have been practically confined to marine practice, possibly because this was the most active field for developing the steam engine at that time, and some idea of the thoroughness of the investigation is obtained from the accounts of long voyages, covering several thousand miles, of which records were kept of the amount of coal burned when the engines were worked with superheated steam and of corresponding voyages using steam without superheating.

In this first volume of researches Chief Engineer Isherwood discusses this matter quite carefully and draws the general conclusion that, while great economy is doubtless to be obtained by using superheated steam in engines, the extra bulk and weight of the apparatus required to produce the superheat, the vulnerability of the same to destruction, but more especially the bad effects of superheated steam on the interior working parts of the cylinders and valves of the engines, chiefly due to the destruction of the lubricating oils before they have had a chance to perform their work, constituted real difficulties which rendered the use of superheated steam at that time undesirable. In spite of this carefully considered condemnation and Isherwood's apparent attempt to dismiss the subject as being the wrong line to pursue in steam engine development, the question of superheating seems to have continued to attract wide attention. The saving in the coal pile was too great to be ignored, and engine constructors and owners were tempted by the reduction in operating expenses to take the risk of inefficient lubrication and the other attendant difficulties, and so much progress was evidently made that we find in Isherwood's second volume of *Experimental Researches*, issued only two years later, even more attention devoted to superheating than before and with quite different conclusions. In fact, superheating is distinctly recommended, and the statement made that the average gain in work done of about 33 per cent. may be counted upon. He recommends the steam to be superheated not more than 135 degrees F., and suggests 100 degrees as an average which it is safe to assume because of the inability of the oil to stand a higher temperature without destruction.

The primitive form of the engine, the inefficient insulating covering, and the low pressure used at that time were conditions which undoubtedly lent themselves to making the use of superheated steam exceedingly advantageous, and the difficulties of lubrication, packing of stuffing boxes, etc., must have been found to be very great in order to cause this practice to be discontinued for so long a time, as it undoubtedly was. At the same time the compounding of steam cylinders, the introduction of condensers, the improvement in valve gear and general construction, the increase of steam pressures, and other radical improvements were so rapidly brought into general use that the amount of work done per unit of steam was raised to a higher point than ever before, in spite of the drawbacks of moist steam.

As the superheater was lost sight of, the improvements which were being adopted in other directions were of such a nature as to diminish its importance. Let us examine these im-

provements to the steam engine. Have they in any way interfered with it as a user of superheated steam? On the contrary, we find the steam engine of the present day much more suited to the use of superheated steam than formerly. We now have mineral oils which will stand high temperatures without disintegration; we have stuffing boxes packed with metallic packing; we have cylinders and steam pipes covered with a much more efficient insulating material; we have the wearing surfaces of cylinders and pistons machined to a nicety, and the interior surfaces often highly polished; we have improved forms of balanced and steam tight valves, and these with our present searching after every device to make the engine more economical, seem to open a field for the superheater to an almost unlimited degree.

In Europe we find much encouragement in this belief. We Americans have characteristically developed the line following the path of least resistance, practically ignoring the question which had seemed to be set aside. Europeans, however, particularly on the Continent, also true to their characteristics, seem to have been plodding along in the direction which they knew to be meritorious, gradually working out the problems, and slowly overcoming the obstacles, until we now find them in a state very much in advance of ourselves.

In this matter great credit is due to that able Alsatian engineer, G. A. Hirn, and to his successor, Emil Schwoerer, and also to the German engineer, W. Schmidt, for keeping this subject alive. We find them with records of several thousand successful installations of large and small plants, and European engineers educated up to a point where no economical steam plant is seriously contemplated without including the superheater. Most of the records of these tests show a saving in steam and fuel ranging from 6 per cent. to over 20 per cent.

What is the reason for this increased efficiency of steam when superheated? Rankine discusses the question in his work on the steam engine.

1. We raise the temperature at which the steam receives its heat and so increase its efficiency without producing a dangerous pressure. According to the law of efficiency of thermodynamic engines, the heat transformed into mechanical energy bears the ratio to the whole heat received by the fluid as the range of temperatures is to be the absolute temperature at which the heat is received, as follows:

$$\frac{T_1 - T_2}{T_1 + 461.2}$$

The more heat supplied per unit of volume of steam to the engine the more work can be obtained from the engine, and the increase of pressure having a practical limit, this extra heat is to be obtained by superheating the steam.

2. The diminished density of the steam employed to do the work lessens the back pressure, or, as commonly expressed, improves the vacuum. This also applies to the air and vapor which are carried with the steam and further expanded by the increased heat, and are consequently contracted to a much less volume when chilled by striking the cooling surface of the condenser; thus the air pump has less work to do.

3. The prevention of condensation during expansion without the use of steam jackets,

and in a much more effective manner. This is the most important advantage to be attached to the use of superheated steam. Steam jackets are wasteful and inefficient when applying heat to the engine. Inefficient because the contact is only with the steam immediately adjacent to the walls of the cylinder, with probably little effect being derived by the steam in contact with the piston and in the interior of the cylinder out of reach of the radiation from the walls; wasteful because of the full effect of heating the exhaust steam after it has done its work in the cylinder during the waning stages of expansion and throughout the exhausting stroke. This is particularly true of engines which have a pause at the end of the stroke, which pause always finds the cylinder full of steam which has completed its work in the cylinder and is ready to be exhausted. Ample evidence of the truth of this statement is found in the high ratio of water condensed in the jackets of direct-acting pumping engines to the amount of steam used in the cylinders.

The use of superheated steam is bound to have an important effect on the question of jacketing cylinders. If the superheating is sufficient to carry the steam through the engine to the point of final exhaust without reaching the saturation limit, there is evidently no use for steam jackets. This, however, necessitates the careful covering of the cylinder walls and steam passages to prevent as much radiation as possible, and the logical development of this question would seem to be to abandon the low-pressure jacket first, and follow by giving up the intermediate, and finally the high-pressure jackets, and substitute for these ample intermediate reheaters, between the cylinders, so proportioned that each cylinder would exhaust its steam at a point just sufficiently above the temperature due to the pressure to insure the absence of any condensation.

The use of perfectly dry steam and the elimination of condensed water would seem a very practical advantage of superheating. Water is a disturbing element in steam engines and pipes at all times. It increases the friction of the wearing surfaces, interferes with the lubrication, and chokes up the discharge; it produces unequal strains in the metal, due to different temperatures, and often gives leaks at joints which remain perfectly tight under dry steam. Dripping at stuffing boxes is also avoided in this way.

It has always been difficult to determine the actual amount of moisture which is contained in steam; some light is thrown on the subject by the use of superheated steam. For instance, at a working pressure of 125 lbs. 1 per cent. moisture would represent about 20 deg. of superheat. We find under the best conditions of properly proportioned steam pipes, and well covered, a loss of 1.5 of a deg. F., to 1.3 of a deg. F., of superheat per foot of steam pipe. It would not be out of reason to assume that with the ordinary large and indifferently covered steam pipe the loss would reach even as much as 1 deg. F., for every foot of pipe; consequently a pipe 100 ft. long might lose 100 deg. of superheat, corresponding to 5 per cent. of moisture in the steam, provided the steam was dry on leaving the boiler. Even assuming $\frac{1}{2}$ deg. loss per foot, we should have a condensation of $\frac{1}{4}$ per cent. in a steam pipe of this length.

As the friction for superheated steam is much less than for saturated steam in passing

there is not so much loss in ports and passages, and the size of the pipes may be considerably reduced. The tendency in this country has been to use steam pipes which are much too large. Good practice with superheated steam recommends that the velocity should not be less than 100 ft. per second passing from the boiler to the engine. Of course, this means ample steam receivers in proximity to the engine, and a good plan would be to have those receivers fitted with reheating tubes containing steam which is being circulated through the superheater, or else a portion of hot furnace gases, diverted from their course for this purpose, and returning again to the boiler flue by means of an induced draft.

Having once evaporated water into steam at an expense of 1,000 or 1,100 heat units why allow it to condense and drop over 800 of the heat units before doing its work, and rush forward more steam to take the place of that which is lost, instead of supplying the necessary heat for the re-evaporation, thus saving the heat originally expended.

As to the present effect of superheated steam on lubricating oils and stuffing box packings, it may be said that the present practice provides, and in fact already demands, oil and packing which will easily withstand these conditions. Mineral oils have supplanted the old vegetable oils and animal fats which were formerly used with machinery, and metallic steam packings have been universally adopted. Both of these were necessitated by the temperatures due to the steam pressures in the vicinity of 150 lbs. to the square inch, which is now common practice; hence, we already have the way thoroughly paved for the introduction of superheated steam.

We have mentioned European practice in this direction. There we find no prominent central station designed without providing for superheated steam; engine builders make guarantees contingent upon it, giving an advantage averaging about 12 per cent. in pounds of steam per horse power based upon the steam being superheated. The range of temperatures has resolved itself into recommending the use of steam at between 500 deg. F. and 600 deg. F. Good practice abroad may be said to lie in the vicinity of 570 deg. Experimenters have observed that steam expands more rapidly during the first 20 deg. of superheating than when further raised in temperature; consequently the first effects are proportionately more beneficial.

The method of constructing the superheater naturally presents the most important aspect of the situation after deciding that the results are beneficial and desirable.

Dismissing the subject of superheating by means of wire drawing as being inefficient and impracticable, the methods resolve themselves into a system of tubes or pipes, through which the steam is passed after leaving the boiler on its way to the engine; these pipes being subjected to the hot furnace gases, either in connection with the steam boiler itself or in a separate setting having a fire of its own. In large plants it is usual and even more desirable to set the superheater by itself, and it is placed alongside of the boiler as a continuation of the battery, with fronts and setting similar to the boilers, and fired in the regular manner as the boilers. The fact that the results are found to justify such an addition to the plant is the best testimony in favor of superheating.

Much rivalry exists between the use of cast-

iron and wrought-iron tubes for superheaters, and there seem to be well defined governing conditions in different instances where either one or the other is found the most desirable.

For general use, however, the author unquestionably leans towards the cast-iron construction, believing that it possesses greater durability, and because of the greater mass of heated metal which serves to maintain the temperature of the steam at a more even point, regardless of not being so much affected by the working of the fire.

The same objections which are raised to the use of cast-iron in boiler construction can not apply to superheaters. The presence of water in a boiler gives rise to unequal temperatures, which produce severe internal strains in the metal, whereas a superheater contains no water, and the comparatively even temperature of the steam relieves the metal of all strains except those due to the bursting pressure.

The cast iron superheaters which the author inspected had great strength and durability; some of them had been in use for six years without giving the slightest trouble or showing signs of deterioration.

The point of application of this type to the boiler varies with the construction of the latter. For instance, the most favorable location on a Babcock & Wilcox boiler is immediately over the tubes and under the shell; the same is also true of a Heine boiler; but at the same time a good arrangement may be made in either of these types by placing the superheater back of the bridge wall and underneath the tubes. In the independently fired boiler of the marine type the superheater may be placed in the main flue or at the back of the boiler where the gases are turned up to enter the tubes. In an ordinary return tubular boiler the flue at the back, immediately at the entrance to the tubes, is a very appropriate place for the superheater, as on account of the high temperature at that point the heating surface may be distributed with great efficiency.

The Babcock & Wilcox Company make a simple and ingeniously arranged superheater of this type consisting of two cast-iron headers set parallel and adjacent to each other, with openings facing in the same direction. The headers are joined by rows of 1½ in. wrought return bends, which extend out into the hot gases.

This arrangement is well adapted to the popular form of the Babcock & Wilcox boiler and efficiently utilizes the triangular space between the horizontal drum and the tubes.

As to the actual results which may be promised to any prospective user of superheated steam, we shall content ourselves with the statement that this depends entirely upon the surrounding conditions. That some benefit may be derived is without question. It is a remarkable fact that throughout all the mass of evidence which has been accumulated during many years one result seems to be universal, however vague or incomplete the recorded data—superheating always results in a considerable economy of steam used.

After all, a conclusion of this sort is about all which could be expected from a mass of reports, from widely different sources, of tests made according to no common standard. In such cases the data are bound to be incomplete, but not altogether without value on this account. If we find such important items as the temperature of the fire, rate of combustion, temperature of escaping gases, efficiency

of boiler, amount of draft, etc., omitted, these tests may be regarded of less value from a scientific point of view, or as an aid to the constructor, yet we are glad to have them for the assistance which they give us in forming an opinion of the general subject.

We feel convinced that much improvement in steam engine economy may be obtained by using superheated steam, even in the highest class of engines of the present day.

We believe the superheating of steam will give the triple expansion engine somewhat of a setback. We have records of tests under which a compound engine with superheated steam has given better results, under similar conditions of work, than a triple expansion.

The superheater virtually adds to the heating surface of the boiler. In a well proportioned plant, where the waste gases are rejected at a low temperature, the net gain by superheating will obviously be less than in a plant where available heat is allowed to find its way to the chimney. We are always sure of some improvement, but each case must be considered by itself in determining the amount.

PERSONAL MENTION.

Mr. David L. Gitt of Washington, D. C., has been selected by the American Wireless Telegraph Company of Philadelphia, Boston and New York to represent that company at Atlantic City this summer.

Mr. Nelson Perin, president of the United Railways & Electric Company of Baltimore, Md., will retire at the next meeting of the directors, and will be succeeded by George R. Webb, who is also president of the Maryland Telephone Company.

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended June 19:

Aberdeen, 6 packages, \$500; Antwerp, 43 packages, \$2,726; Amsterdam, 4 cases, \$54; Australia, 14 packages, \$2,080; Barcelona, 2 packages, \$102; Belfast, 15 cases, \$990; Berlin, 1 package, \$275; Brazil, 21 packages, \$390; Bremen, 1 package, \$327; Bristol, 11 cases, \$500; British East Indies, 1 package, \$57; British Africa, 11 cases, \$3,384; British West Indies, 16 packages, \$371; Brussels, 1 package, \$100; Central America, 1 case, \$13; Copenhagen, 1 case, \$26; Cuba, 35 cases, \$375; Dundee, 3 packages, \$150; Ecuador, 2 packages, \$33; Glasgow, 45 packages, \$3,193; 22 reels cable, \$10,669; Hamburg, 72 packages, \$8,097; 12 auto vehicles, \$1,275; Havre, 49 cases, \$25,221; 14 packages, \$1,688; Liverpool, 80 packages, \$4,858; London, 222 cases, \$7,221; 9 motor vehicles, \$3,780; Manchester, 3 cases, \$1,365; 543 packages, \$60,323; Mexico, 83 cases, \$710; Moscow, 1 case, \$90; New Castle, 2 packages, \$100; Peru, 1 package, \$70; Preston, 20 packages, \$900; Southampton, 3 cases, \$490; 25 packages, \$894; U. S. Colombia, 4 cases, \$750; Venezuela, 3 packages, \$33; Wall-sall, 14 packages, \$559.

Change in Sixty-nine Years.

I have just looked upon two pictures, one entitled "DeWitt Clinton and Train—1831" and the other "Empire State Express—1900." The former shows the primitive locomotive DeWitt Clinton, belonging to the New York Central Railroad, drawing a train of three old Concord stage coaches at its top speed of 15 miles an hour over the 17 miles of track which constituted the "New York Central System" sixty-nine years ago. It is most comical. The latter exhibits the Empire State Express going 65 miles an hour with its splendid train of rolling palaces on a part of the same "system," now grown from 17 miles to 10,453. The road's equipment in 1831 was one engine and three made-over stages; to-day it is 3,580 locomotives, 185 sleeping and parlor cars, 3,600 passenger, baggage, mail and express cars and 150,400 freight cars. This equipment carried over 52,000,000 passengers in 1899 and more than 103,000,000 tons of freight. Something of a contrast—"On the Tip of the Tongue" in the New York "Press."

INCORPORATIONS.

The Greensboro Electric Company, Greensboro, N. C. Capital stock, \$250,000.

The Randall Electric Company, New York City. Capital stock, \$10,000. Directors: P. M. Randall, N. E. Randall and J. G. Gorham, all of New York City.

The Standard Insulation Company, New York City. Capital stock, \$100,000. Directors: Bernhard Sandel, Peter Fogarty and Arthur Heine, all of New York City.

The Spencer Electrical Company, New York City. Capital stock, \$100,000. Directors: J. H. Spencer of New York City, C. L. Child of Montclair, N. J., and Henry Dawson of Richmond Hill, L. I.

The Watkins Consolidated Electric & Gas Light Company, Watkins, N. Y. Capital stock, \$100,000. Directors: A. R. Horn of Catsauqua, Pa., J. J. McKee of Bethlehem, Pa., and Charles B. Reid of New York City.

The New York & Richmond Gas Company of New York City, Albany, N. Y.—to furnish gas and electricity in New York City, particularly in the Borough of Richmond. Capital stock, \$1,500,000. Directors: Armitage Matthews and Robert C. McCormick of New York City, Archibald A. McGlashan of East Bloomfield, N. J., G. W. Sutton of New Rochelle and Hawkins A. Tucker of Brooklyn.

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED JUNE 18, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

676,745. Electrohydraulic Brake for Railway or Like Vehicles. Andre Goldschmidt, Paris, France, assignor to Compagnie Internationale du Frein Electro-Hydraulique Durey, Brussels, Belgium. Filed Feb. 12, 1901.

ELECTRIC LIGHTS AND APPLIANCES.

676,848. Incandescent Lamp. Christian Hoelscher, Warren, O., assignor of one-half to the Wiswell-Fritchard Electric Mfg. Company, Niles, O. Filed May 25, 1900.

ELECTRICAL MACHINERY AND APPARATUS.

676,426. Rheostat-Controller. John Dillon, Milwaukee, Wis. Filed March 22, 1901.

676,439. Pole-Piece for Dynamo-Electric Machines. Frank A. Merrick, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed March 20, 1901.

676,520. Electric Motor. Arthur P. Warner, Milwaukee, Wis., assignor of one-half to the Northern Electrical Manufacturing Company, Madison, Wis. Filed Oct. 22, 1900.

676,849. Circuit-Breaker Trip. Arthur J. Purinton, Waterbury, Conn. Filed May 9, 1900.

TELEPHONES AND TELEPHONE APPARATUS.

676,517. Supervisory Signal for Telephone-Switchboards. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Aug. 15, 1898.

MISCELLANEOUS.

676,436. Telegraphic Instrument. Harry T. Johnson, Jersey City, N. J. Filed July 5, 1900.

676,441. Fan Motor Support. Fred P. McBerty, Warren, O. Filed June 12, 1900.

676,524. Electrode for Secondary Batteries. Wilson H. Abbey and Jacob Altmos, Cleveland, O. Filed Aug. 25, 1900.

676,575. Electric Furnace. Alfred H. Cowles, Cleveland, O., assignor to the Electric Smelting & Aluminum Company, same place. Original application filed July 6, 1895. Divided and this application filed April 9, 1897.

676,576. Electrode Connection for Electric Furnaces. Alfred H. Cowles, Cleveland, O., assignor to the Electric Smelting & Aluminum Company, same place. Original application filed Nov. 24, 1899. Divided and this application filed Aug. 30, 1900.

676,577. Electric Smelting Process of Reducing Sodium Compounds. Alfred H. Cowles, Cleveland, O., assignor to the Electric Smelting & Aluminum Company, same place. Original application filed July 20, 1895. Divided and this application filed Sept. 27, 1900.

676,583. Electrical Apparatus. Thomas B. Kinraide, Boston, Mass. Filed Aug. 13, 1900.

676,618. Magnetic Separator. Thomas A. Edison, Llewellyn Park, N. J. Filed July 16, 1897.

676,738. Electrically Propelled Boat. William R. Edwards, Weybridge, Eng. Filed March 2, 1901.

676,744. Burglar Alarm. Orval J. Gatten, Columbus, O. Filed Feb. 4, 1901.

676,840 676,841. Magnetic Separating Apparatus. Thomas A. Edison, Llewellyn Park, N. J. Filed Jan. 9, 1900, July 2, 1900.

676,853. Electrically-Illuminated Cross. Henry J. Schlacks, Chicago, Ill. Filed April 22, 1899. Renewed May 15, 1901.

676,874. Automatic Telegraph. Harry Shoemaker, Philadelphia, Pa., assignor to Gustave P. Gehring and Marie V. Gehring, same place. Filed Feb. 12, 1901.

THE TELEPHONE WORLD.

Independent Companies to Build a Trunk Cable

Indiana capitalists have bought a considerable portion of the stock in a company proposing to build a trunk telephone cable to result in a consolidation of the independent plants in Iowa, Kansas, Missouri, Texas, Indiana, Ohio, Illinois and Pennsylvania. The plan is to have the cable start in Texas, and run through the southwestern States to St. Louis, and then east to Pittsburgh. The individual companies will pay tolls to the trunk company. The new scheme is to be capitalized at \$500,000, but it is understood that does not represent the total cost. Nearly all the stock has been sold.

University Place, Neb., is threatened with more extended telephone service. It is understood there that the Plattsmouth Independent Telephone Company will ask permission to extend its lines into University Place at the next meeting of the city council. This company secured a franchise at Havelock, where it expects to open a local exchange as soon as its lines can be extended from Greenwood, Neb., the present nearest point on the independent line. A representative of the Nebraska Telephone Company has also been canvassing the merchants. As far as possible the old company will endeavor to forestall the competition of its newer rival, an endeavor to install many new party lines to pay as the 'phones are used being part of the present programme.

The common council of Litchfield, Mich., has granted a 30-year franchise to L. B. Agard and others, giving them the privilege of erecting poles, stringing wires and conducting a general telephone business in that village. A stock company will be immediately organized. The stock has already been more than subscribed for. The company proposes to erect lines in the country connecting with the farm houses, and also to connect with Homer and Concord, which have local service. Enough telephone contracts have been signed to make the venture a success.

At a recent meeting of the Norwood, Pa., council ordinances granting permission to the Keystone State and the United Telegraph & Telephone Companies to erect and maintain their lines in the borough were adopted on second reading. Bills amounting to \$398 were ordered paid. The treasurer reported a balance of \$14 in the treasury.

The New England Telephone & Telegraph Company is constructing a line connecting Meredith, N. H., with Pine Island in Lake Winnepisegee. The line will be seven miles in length, and the overhead wire will cross three other islands in order to reach the terminal. The greatest length of span across water is 500 feet.

The Michigan Telephone Company reports a net gain of 2,407 subscribers in May, making a total number of 49,609 subscribers on May 31. The Erie telephone system, of which this company is a part, reports a net gain of 3,564 subscribers in May and a net gain of 8,545 since January 1, making a total number of 150,144 subscribers on May 31.

The farmers of Crawford County, Ind., have been putting up private telephone lines, and nearly every farm house is provided with a 'phone. They secured right-of-way over the public roads into the town of English. The cost is very small, being \$10 for a share of stock and \$14 for a box, while the service is free to all points.

The Rocky Mountain Bell Telephone Company has a large force of men at work on a line between Big Timber and Helena, Mont., on a cross State long-distance line. From Lameli the company will erect a branch line to Red Lodge, and later extend the same to Cody, Wyo.

The Pensauken, N. J., township committee has granted a franchise to the City & Suburban Construction Company to erect poles and string wires, lines and cables for the purpose of operating a telegraph and telephone exchange in the said township.

The borough council of Collingdale, Pa., has granted the Atlantic Telegraph & Telephone Company permission to place poles and string wires throughout that borough.

The New York & New Jersey Telephone Company has established a new central office in Port Washington, N. Y., and in the near future it will be open night and day.

The Dirigo Telephone Company has extended its line to the West Peru and Dixfield, Me., railroad station, also to West Peru village.

The Cumberland Telephone Company has a force of hands at work putting in an exchange at Hodgenville, Ky.

Another Independent Company for Michigan.

The Stoddard Telephone Construction Company is organizing an independent telephone company in Monroe, with a view to giving connections with the United States Telephone Company's long-distance circuit, besides local service. The organization of the new company is about perfected, and the work of soliciting subscribers for the local exchange will follow immediately. The Stoddard Company manufactures telephones and switchboards, many of which are now in use in that State, and is in a position to equip an independent exchange at once.

Growth of Independent Companies in Kentucky.

The Kentucky Telephone Association will hold its meeting in Lexington, this week. The independent movement has made vast strides in that State, during the past six months. Lexington has recently put in an exchange and toll lines to adjoining counties. Louisville is at work on a million capital, and will, in addition to a large exchange, have connections not only throughout the State, but to neighboring States. There are more than fifty local companies interested in the Association, and they propose to network the State and place telephones within the reach of the masses and at reasonable rates.

Bishop Preston is negotiating with the Bell Telephone Company looking to the putting in of a telephone line between Salt Lake City and Wasatch, Utah. If built, the communication will be made via Sandy. A telephone will also probably be put in at Brighton this year. In addition to the request of the summer resort people, several mine owners in close proximity have expressed a desire for better communication with Salt Lake City than is now possible and it is believed that a combination will be formed of sufficient magnitude to induce the telephone company to construct the line.

The Colorado Telephone Company directors, at a special meeting in the Telephone Building, at Denver, voted to renew the corporate life of the company for twenty years. The laws of the State only allow an incorporation to take out a charter for twenty years, at the expiration of which time it must be renewed. That period has elapsed since the Colorado Telephone Company was formed, and the old articles will be filed again with the Secretary of State without change.

A special meeting was recently held by business men of Gibbon, Neb., to get an expression as to the advisability of putting in a telephone exchange in that place and tributary territory. The vote was unanimously in favor of a system, and steps will be taken at once to have one installed.

The Richmond & Damon Mound, Tex., Telephone Company was organized a short time ago to be chartered for \$10,000. The line has been completed and is doing a fine business. J. H. P. Davis is president; T. B. Wessendorf, vice-president; E. D. Bell, secretary and treasurer.

News from Minneapolis, Minn., states that the series of wind and electrical storms during last week has caused the Northwestern Telephone Company much trouble with its service, and necessitated the expenditure of several thousand dollars for repairs.

The telephones for the Flanagan, Ill., telephone system will be put into operation at once. Flanagan will thus be connected in a short time with all the surrounding towns, and as there are four country lines running in there it will thus be a center for telephonic communications.

At a recent meeting of the Napoleon, O., council, a franchise was granted to the Citizens' Mutual Telephone Company, with an exchange at Napoleon. Several local exchanges are located in the south and eastern parts of Henry County.

About 3,000 copper contracts have already been secured by the canvassers of the People's Telephone Company of Detroit, Mich.

A report from Cleveland, Tenn., says, unwilling to pay increased rates of the Cumberland Telephone Company, business men will establish a new company.

The new telephone company of Louisville, Ky., is preparing to invade Jeffersonville in that State. It will be given hearty encouragement.

The Holston Telephone Company has extended its line across the Holston River into the New Hope, Tenn., neighborhood.

Long Distance Telephone Extension.

The United States Telephone Company will extend its line from Logan to Nelsonville, O. Work has already begun on the extension at the other end of the line. The required material was sent down the valley, and the force of workmen is now at work. The United States Company is the long distance line of the Standard, and has entered the field as a competitor of the Bell. It has proven a strong competitor to the old company and is adding new toll stations to its service in Ohio almost every day. The long-distance service of the local company is by this company.

Chinese Telephone System.

What is said to be the only Chinese telephone system in the world is in operation in the city of San Francisco, Cal. There are altogether about 18,000 Chinese citizens, of whom 1,500 are merchants. Of this number 270 are subscribers to the telephone.

These Chinese merchants were prompt to understand the saving of time and great convenience in the use of the instrument. Though looked upon, for a time, with some superstitious dread, familiarity has accustomed the people to its use and it has now become an indispensable concomitant of the regular office equipment. The central office heretofore has been too small to allow any increase of the subscribers, but the company has recently acquired a property and is fitting it up so as to accommodate any number. It is expected that with greater facilities twice as many instruments as are now in use will be installed.

The system in Chinatown is entirely independent and is for the Chinese only. To communicate with outside subscribers a separate charge is made. A white merchant using the Chinatown system must also pay extra. The Chinese subscribers can and do use the long distance wires upon payment of the customary charges.

The Dauphin County Telephone Company of Harrisburg, Pa., will vote upon the question of increasing the indebtedness to \$300,000 at a meeting early in July.

The independent telephone exchange at Sellersburg, Ind., which is connected with the Home Telephone Company's system in New Albany, is now opened with 135 subscribers.

The Peninsular Telephone Company of Tampa, Fla., has been granted a franchise for Bartow in that State.

Telephone Companies Increase Stock.

The Tazewell County Telephone Company of Vermont, Ill., from \$1,500 to \$10,000. The Monmouth Telephone Company, Monmouth, Ill., from \$35,000 to \$50,000. The Northern Iowa Telephone Company of Des Moines, Ia., from \$20,000 to \$40,000.

TELEPHONE INCORPORATIONS.

The Albion Telephone Company, Albion, Neb. Capital stock, \$20,000.

The Emporia Telephone Company, Emporia, Kan. Capital stock, \$60,000.

The Hamilton County Farmers' Telephone Exchange Association, Aurora, Neb.

The Waveland Telephone Company, Waveland, Ind. Capital stock, \$1,000.

The Shannondale Co-operative Telephone Company, Shannondale, Ind. Capital stock, \$600.

The Citizens' Telephone Company, Pekin, Ill. Capital stock, \$50,000. Incorporators: James M. James, James W. Barrett and E. R. Priton.

The Wenona Telephone Exchange, Wenona, Ill. Capital stock, \$2,500. Incorporators: M. E. Gants, Edwin Gants and H. Ray Judd.

The Marengo Telephone Exchange, Marengo, Ia. Capital stock, \$7,500. J. H. Branch is president, Henry Gode; vice president; H. N. Havner, secretary, and John Kell, Jr., treasurer.

The Orion Telephone Company, Orion, Mich. Capital stock, \$5,000. Officers: President, Ira Carpenter; treasurer, I. C. Predmore; secretary, Attorney, Fred Wieland; manager, H. E. Goette.

The Beaumont Telephone Company, Beaumont, Tex. Capital stock, \$60,000. Incorporators: Melville D. Shaw, Chas. N. Haskell, James King Duffy, James E. Boynton, Charles H. Roser, Sheppard H. Van Wanner and William H. Aldridge.

GENERAL ELECTRICAL NEWS.

Lighting.

Augusta, Ga.—The city council is figuring on an electric lighting plant for the city hospital. The commissioner of public works, N. Wingfield, will advertise for bids for the plant.

Bloomington, Ill.—J. Van Dolah and C. P. Herog are preparing to improve the electric light plant at this place.

Cincinnati, O.—Sealed proposals will be received at the city clerk's office until 12 o'clock m. of July 12 for lighting by electricity the streets, lands, lanes, squares and public places of the city for a period of ten years from June 1, 1902. Said proposals shall be based upon specifications, copies of which will be furnished by the city clerk to any person or persons desiring to bid thereon. All proposals must be addressed to the Committee on Light of the Board of Legislation, care of the city clerk and be upon the form attached to the specifications, and should be marked "Proposals for Electric Lighting" on the outside.

Cullom, Ill.—E. E. Saylor of Gilman has been given a contract and 20-year franchise to light the streets of this place.

Elba, Ala.—P. R. Hightower of Quitman, Ga., has made a contract to place an electric plant in this place.

Geneva, O.—Local capitalists contemplate the erection of a new electric light plant.

Hamlet, N. C.—T. A. Sanders of Boston and M. C. Freeman will install an electric light plant at this place.

Highland, Ill.—At a recent meeting of the city council it was decided to improve the electric light plant at a cost of \$880; also recommended the electric light committee to take the necessary steps toward securing a new 125 horse power engine.

Lake Placid, N. Y.—Clarence Brokaw will install a 500 horse-power electric light plant here.

Memphis, Tenn.—A party of Chicago capitalists have asked the city council to grant them a franchise for 30 years for a commercial lighting plant. They are organized as the Little Rock Light, Heat & Power Company.

Muskegon, Mich.—The common council has passed a resolution allowing the Muskegon Traction & Lighting Company to erect a new combined power house and electric lighting station at a cost of \$100,000.

Ponca, Okla.—A contract has been closed here for an electric light plant with Samuel J. Mathews & Co. of Kansas City. It is to be completed by August 15.

Red Wing, Minn.—Bids will be received until July 5 for lighting the streets of this place for a term of one, three and five years respectively. C. E. Harrison, city clerk.

Roseville, Ill.—The question of erecting an electric light plant is being agitated at this place.

Rutland, Ill.—S. Bacorn, owner of the electric light system here, sold the plant to J. S. Webber. The new owner will make many improvements.

Saratoga, Wyo.—E. Storer Tice of Denver and J. M. Thomas, Jr., of Battle Lake, Wyo., have been granted a franchise for an electric light plant for this place.

Sturgeon Bay, Wis.—The citizens will soon vote on a proposition to erect an electric light plant.

Sardis, Miss.—The Sardis Electric Light & Power Company has been organized for the purpose of erecting an electric light plant at this place. About \$9,000 is to be expended.

Tell City, Ind.—The Tell City Water & Light Company has been organized with \$40,000 capital stock. An electric light plant is to be erected.

Tipton, Ind.—The city council has entered into a contract with the Wayne Construction Company of Ft. Wayne to build for the city a modern electric light plant at a cost of \$35,000.

Way Cross, Ga.—The Way Cross Ice Company has under consideration the erection of a new electric light plant.

Waynesboro, Ga.—The city is investigating the erection of an electric light plant. Address W. M. Fulcher and P. B. Hall.

Winchester, Tenn.—Kirkpatrick & Johnson of Jackson, Miss., have prepared the plans for the erection of a new electric light plant in this city.

Street Railways.

Baltimore, Md.—The Baltimore, Westminster & Gettysburg Railway Company, a franchise for which has been granted under the new General Rapid Transit law in Pennsylvania, will construct lines which will make a continuous trolley road from this city to points in Southern Pennsylvania. The United Railways of Baltimore are interested. The City Suburban system will connect with the Gettysburg at Reisterstown. Baltimore County. The corporators of the new company are L. A. Sweigard, T. E. Durham and W. H. Bartlett of Philadelphia, and Charles E. Fink of Maryland.

Bethel, O.—The Cincinnati & Suburban Traction Company has been incorporated for \$750,000 by J. R. Scrugham, R. T. Belt, N. Wolf and others. An electric railway will be built from Linwood to this place.

Birmingham, Ala.—J. W. O'Neill of this city is reported as interested in the proposed electric railroad between here and Wylam with several branches.

Chattanooga, Tenn.—The Chattanooga Rapid Transit Company has secured a franchise to build its electric line on several thoroughfares of this city. S. W. Divine is president of the company.

Corning, N. Y.—The proposed electric line between Elmira and here seems an assured fact from the statement of H. B. Rhymer of Elmira, one of the promoters.

Cortland, N. Y.—The Cortland County Traction Company was lately incorporated for \$320,000 to operate the franchises of the Cortland & Homer Traction Company.

Danbury, Conn.—Surveys for the electric railroad between here and Golden Bridge, N. Y., have been completed, contracts have been awarded, and construction will shortly begin. The road will be about 17 miles long.

Denver, Col.—The Denver & Northwestern Railway Company has been incorporated by S. M. Perry, C. J. Hughes, F. Perry and A. Smith. The new company proposes to build an electric line from this city to the mouth of Platte canon, Boulder, Greeley, Louisville, Littleton and Golden.

East St. Louis, Ill.—An electric railway from Alton to Venice, connecting at the latter place with the East St. Louis line will soon be built by capitalists of this place and Alton.

Knoxville, Tenn.—The Knoxville Traction Company contemplates making an extension to its present trolley system.

San Bernardino, Cal.—The San Bernardino Traction Company has been formed with \$500,000 capital stock for the purpose of building and operating an electric street railway. H. Fisher, H. Sinclair, E. S. Graham, A. C. Debnan and J. H. Fisher are the incorporators. The road will be extended to Riverside, Highland and Los Angeles.

Sparta, Mich.—Attorney M. M. Atherton who is associated with J. L. Hisey in the promotion of the Grand Rapids & Newaygo Electric Road announces that work will begin on the line about July 1.

Company Matters.

Chattanooga, Tenn.—J. H. Jefferis and Clarence P. King, of Philadelphia, president and director respectively of the Chattanooga Rapid Transit Company, are here conferring about the proposed extension of the Rapid Transit lines from the city to the base of Lookout Mountain, to connect with the Mountain Incline, now owned by the Rapid Transit Company.

Keyport, N. J.—The electric light company has been reorganized as the East Jersey Light & Power Company with a capital stock of \$250,000.

New York City.—It was announced in Wall Street circles June 19 that arrangements for the consolidation of the Otis Elevator Company and the Sprague Elevator Company have been practically completed.

Oakland, Cal.—Articles of incorporation of the Suburban Electric Light Company have been filed with the county clerk. The directors are stated to be J. H. Lawrence, William Angus, Wellington Gregg, Sr., and James L. Robinson of Oakland and E. P. O'Brien of San Francisco. The amount of the capital stock is fixed at \$500,000.

Riverside, Cal.—A company has been organized here by E. A. Chase and M. A. Chase, which will deal in electricity, etc., with \$400,000 capital stock.

Manufacturing.

Chicago.—The Duncan Electric Manufacturing Company has lately been incorporated with a capital of \$100,000. It purposes manufacturing electrical supplies. C. A. Brown, G. I. Cragg and H. L. Harrison are interested in the concern.

Newark, N. J.—Articles incorporating the Porto Rico Electric Company were put on record a short time ago. The concern is a foreign one with its chief local office at 169 North 9th street, where Edward W. Rockefeller is the legal representative. The company is authorized to manufacture and deal in electrical motors, dynamos and other electrical machinery in the island of Porto Rico and elsewhere, except New Jersey, and "to manufacture, buy and sell electrical current for light, heat and power," besides carry on the business of railway contractors and ship-owners. Its authorized capital stock is \$100,000.

New York City.—The Commercial Development Company has been formed to manufacture and sell electrical goods on a capital stock of \$500,000.

Pittsfield, Mass.—The Stanley Electric Company has begun work on one of the largest pieces of electrical machinery it has ever constructed. It is a generator 23 feet in diameter, and will cost with its full equipment about \$50,000. It will be of 1,725 kilowatts capacity, and will furnish power for 40,000 lights.

Power and Transmission.

Detroit, Mich.—James D. Hawks is promoting a salt and electrical power plant for the Rouge district, where the River Rouge Improvement Company, of which he is secretary and the principal stockholder, owns a large tract of land. The company will have a capital of \$6,000,000.

Gainesville, Ga.—The Gainesville Light & Power Company is a new corporation now applying for a charter, and has asked the city council for franchises. The company is to be capitalized at \$100,000, and proposes the development of the water power at the Chattahoochee River, owned by Col. S. C. Dunlap. Among the incorporators are F. L. Murray, of Chicago; J. J. Spalding, of Atlanta; J. J. Dunlap, Z. T. Castleberry, H. H. Dear, M. M. Ham, E. E. Kimbrough and Howard Thompson, of Gainesville.

Hagerstown, Md.—A scheme has been unfolded here by which a party of Pennsylvania capitalists propose to harness the Potomac River to supply power for Sharpsburg, Shepherdstown and other towns in this section. It is proposed to erect a dam in the river and convey power to the towns.

Susquehanna, Pa.—It is said that the Erie Railroad Company will construct an electric power plant here in the near future at a cost of about \$40,000. The plant will be placed on the banks of the river, and will be run by water power. It will furnish electric power and light for the shops, yards and station.

Automobiles.

San Jose, Cal.—The Christman Motor Carriage Company, of which W. Payton Smith is president and chief backer, J. F. Stephenson is vice-president and Charles E. Christman, mechanic and general manager, has decided to remove from Los Gatos to this city, as it is necessary to establish a larger factory. The change will be made about July 1. After the removal to this city the business will begin on a far more extensive scale, and the factory will enter into competition on the coast.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by ELECTRICITY from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mfg., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Authoriz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Albany, N. Y. —June 24						
United Traction (Consolidation of the Albany and Troy City Rail way.)	100	\$5,000,000	\$5,000,000	1 1/2 % Q.	106	108
Allentown Pa. —June 24						
Allentown & Lehigh Val. Trac Co		4,000,000	1,800,000		—	15
Bridgeport, Conn. —June 24						
Bridgeport Traction Co.	100	2,000,000	2,000,000	1 % Aug.	100	—
Baltimore Md. —June 24						
United Rail ways & Elec. Co., com.	50	24,000,000	18,000,000		17	17 1/2
Boston, Mass. —June 24						
New England Street Ry.	25	5,000,000	1,081,925	1 % Q., Jan. 15,	—	—
North Shore Traction Co., com.	100	4,000,000	4,000,000		15	16
North Shore Traction Co., pfd.	100	2,000,000	2,000,000	6 % S., A. & O.	85	87
West End Street Ry. Co., com.	50	10,000,000	4,080,000	8 % S., Oct.	95	95 1/2
West End Street Ry. Co., 8 % pfd.	50	6,400,000	6,400,000	4 % S., Jan.	114	115
Boston Elevated R. R.	100	10,000,000		2 1/2 % Aug. 90,	179	181
Brooklyn N. Y. —June 24						
Brooklyn City Ry.	100	2,000,000	1,928,400		245	250
Brooklyn Rap. Transit Co., tr. certif.	100	48,000,000	48,000,000		82	82 1/2
*dBrooklyn Heights Railroad.	100	200,000	200,000		107	109
*dBrooklyn City RR., guar.	100	12,000,000	12,000,000	8 % Q., Jan.	287	289
Coney Island & Brooklyn RR.	100	2,000,000	2,000,000		—	—
Kings County Elevated.	100	2,000,000	1,884,200	2 1/2 % Nov.	325	330
Kings County Traction Co.	100	4,750,000	4,750,000		—	—
Nassau Electric Railroad.	100	4,500,000	4,500,000	1 % July	—	—
*Atlantic Avenue Railroad.	50	6,000,000	6,000,000		82	83
*Brooklyn B. & W. R. Railroad.	50	2,000,000	2,000,000		—	—
Buffalo N. Y. —June 24						
Buffalo & Niagara Falls Elec. Ry.	100	1,250,000	1,250,000		74	75
*Buffalo Railway Co.	100	6,000,000	5,870,500	1 % Q. Dec.	99	100
Columbus O. —June 24						
Columbus Street Railroad.	100	8,000,000	8,000,000	1 % Q., Feb.	38	39
Columbus Street Railroad, pfd.	100	1,500,000	1,500,000		100	102
Charleston, S. C. —June 24						
Charleston City Ry. Co.	50	100,000	100,000	8 % S.	—	—
Enterprise City RR. Co.	25	1,000,000	250,000		—	—
Chicago, Ill. —June 24						
Chicago City Ry. Co.	100	12,000,000	12,000,000	8 % Q., Dec. 31,	250	260
Chicago & South Side R. T. RR.	100	10,828,800	10,828,800		—	—
Lake Street Elevated RR.	100	10,000,000	10,000,000		12 1/2	14
Metropolitan West Side Elev. Ry.	100	15,000,000	7,000,000	Feb 98 1900.	84 1/2	85
Met. West Side El., pfd.	100	15,000,000	9,000,000		92	92 1/2
North Chicago Street RR.	100	10,000,000	6,000,000	8 % Q., Jan.	200	210
South Chicago City RR.	100	500,000	249,900		200	201
South Chicago City Railway.	100	2,000,000	1,608,200		108	109
West Chicago St. RR. Co.	100	20,000,000	18,189,000	1 1/2 % Q., Feb.	103	103 1/2
Union Traction Ry.	100	1,200,000	624,900	8 % S.	18 1/2	18 1/2
Union Traction Co.	100	2,000,000	2,000,000	5 % S.	59	59 1/2
Cincinnati, Ohio. —June 24						
Cincinnati Inc. Plane Ry.	50	1,000,000	575,000		—	—
Cincinnati Inc. Plane Ry., pfd.	50	150,000	150,000	1 % Feb.	—	—
Cincinnati Newport & Cov. St. Ry.	100	8,000,000	8,500,000	2 1/2 % Feb.	75	76
Cincinnati Street Ry. Co.	50	18,000,000	14,000,000	1 1/2 % Q., Jan.	124 1/2	125
Mt. Adams & Eden Park Inc. Ry.	50	2,500,000	2,200,000	1 1/2 % Q., Jan.	124 1/2	127
Cleveland, Ohio. —June 24						
Akron, Bed. & Cleve. Elec. Ry.	100	1,000,000	1,000,000	3 % Jan.	48	50
Cleveland City Ry.	100	8,000,000	7,600,000	8 1/2 % Jan.	100	102
Cleveland Electric Ry.	100	12,000,000	12,000,000	3 % Q., Oct.	80	81
Detroit, Mich. —June 24						
Detroit Citizens' Street Ry.	100	2,000,000	1,250,000		100 1/2	—
St. Wayne & Belle Isle Ry.	100	1,200,000	1,200,000		175	—
Rapid Railway Co.	100	250,000	250,000		90	100
Detroit Electric Railway	100	1,000,000	1,000,000		—	—
Wyandotte & Detroit River Ry.	100	250,000	200,000		100	110
Dayton O. —June 24						
City Railway Co.	100	1,500,000	1,470,600	1 1/2 % Q.	140	145
City Railway Co., pfd.	100	600,000	600,000	1 1/2 % Q.	170	—
People's Street Railway.	100	1,100,000	1,100,000		114	115

PASSENGER RAILWAYS.

NAME.	Par	Authoriz'd	Issued.	Rate and Date of Last Div.	Bid.	Asked.
Hartford Conn. —June 24						
Hartford Street Ry. Co.	100	\$4,000,000	\$200,000	8 % S., Oct.	150	—
Hartford & West Hartford	100	1,000,000	247,000		—	—
Holyoke Mass. —June 24						
Holyoke Street Ry. Co.	100	400,000	400,000	8 % A., June,	207 1/2	212
Hoboken N. J. —June 24						
North Hudson Co. (N. J.) Ry. Co.	25	1,250,000	1,000,000	8 %	150	—
Indianapolis, Ind. —June 24						
*Indianapolis Street Ry.	—	5,000,000	5,000,000		25	25 1/2
Lancaster, Pa. —June 24						
Pennsylvania Traction Co.	100	10,000,000	9,900,000		—	—
Lancaster & Col. Electric Ry.	—	—	87,500		—	—
West End Street Railway	—	—	—		—	—
Louisville, Ky. —June 24						
Louisville Ry.	100	4,000,000	8,500,000	1 1/2 %	82	88
Louisville Ry., com.	100	2,500,000	2,500,000	2 1/2 % S., Oct. 1,	112	113
Minneapolis, Minn. —June 24						
Twin City Rapid Transit.	100	17,000,000	15,010,000		89	89 1/2
Twin City Rapid Transit.	—	8,000,000	1,712,200	1 1/2 %	186	187
Montreal, Canada. —June 24						
Montreal Street Ry. Co.	50	4,000,000	4,000,000	8 % S., M. & N.	279	280
Toronto Street Ry. Co.	100	6,000,000	6,000,000	1 1/2 % S., J. & J.	109 1/2	110 1/2
Memphis Tenn. —June 24						
Memphis Street Railway Co.	100	500,000	500,000		35	—
New Haven, Conn. —June 24						
Fair Haven & Westville RR.	25	2,000,000	2,000,000	8 % S., Sept.	89	41
New Haven Street Railway Co.	100	1,250,000	1,000,000	2 1/2 % A., July	—	—
New Haven & Centerville	100	700,000	800,000		—	—
Winchester Avenue RR.	25	1,000,000	600,000		45	46
New Orleans, La. —June 24						
Canal & Claiborne RR. Co.	40	240,000	240,000	4 % S., July,	—	—
New Orleans & Carrollton RR.	100	1,200,000	1,200,000	1 1/2 % Q., Oct.	148 1/2	153
New Orleans Traction Co. new com.	100	—	—		22 1/2	24
New Orleans Traction Co. new pfd.	100	—	—		95	98
aCrescent City RR.	100	2,000,000	2,000,000	8 % S., Jan.	20 1/2	26
bNew Or. City & Lake RR.	100	2,000,000	2,000,000	4 % S., Jan.	—	—
cOrleans Railroad.	50	500,000	185,000	1 1/2 %	—	—
St. Charles Street Railway.	50	1,000,000	1,000,000	1 1/2 %	56 1/2	57
New York —June 24						
Central Crostown RR.	100	600,000	600,000	2 1/2 % Q.	255	260
aChristopher & 10th Sts. RR.	100	650,000	650,000	2 % Q., Oct.	175	185
Dry Dock, E. Brdwy & Battery RR.	100	1,200,000	1,200,000	1 1/2 % Q., Nov.	120	125
dMetropolitan Street Ry. Co.	100	45,000,000	45,000,000	2 1/2 % Q., Feb. 1901.	175 1/2	176
eBleecker St. & Fulton Fy. Ry. guar.	100	900,000	900,000	3 % A., July,	85	87
fBroadway & Seventh Ave. guar.	100	2,100,000	2,100,000	2 1/2 %	240	245
gGen. Park, N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2 1/2 % Q.	205	210
hEleventh Avenue RR.	100	1,000,000	1,000,000		400	405
i42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	4 % Q.	392	402
jNinth Avenue RR.	100	800,000	800,000		198	200
kSixth Avenue RR.	100	2,000,000	2,000,000		208	210
lTwenty-third St. R. R. Co. guar.	100	600,000	600,000	4 % Q.	400	410
mSecond Avenue RR.	100	2,500,000	1,842,000	2 % Q., Jan.	210	212
nThird Avenue RR.	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.	120 1/2	120 3/4
o2d St. Manhattan & St. Nich. Av.	100	2,500,000	2,500,000		60	75
*Union (Huekberry) Ry.	100	2,000,000	2,000,000		190	200
Newark N. J. —June 24						
Consolidated Traction Co. of N. J.	100	15,000,000	15,000,000		67	68
North Jersey Railway Co.	100	6,000,000	6,000,000		25	26
United Elec. Co. of New Jersey.	100	804,000	804,000	1 1/2 % A.	283 1/2	284
Pittsburg, Pa. —June 24						
Allegheny Traction Co.	50	600,000	600,000		27	28
aConsolidated Traction Co.	50	15,000,000	15,000,000	2 % Jan.	22	22 1/2
bConsolidated Traction Co., pfd.	50	9,478,850	9,478,850	8 % Nov.	62 1/2	63
cCentral Traction Co.	50	1,500,000	1,500,000	1 1/2 % Nov.	78 1/2	78 1/2
dCitizens' Traction Co.	50	8,000,000	8,000,000	6 % A.	72 1/2	72 1/2
eDuquesne Traction Co.	50	8,000,000	8,000,000		—	—
fPittsburg Traction Co.	50	2,500,000	2,500,000	8 1/2 % Nov.	—	—
gFederal St. & Pleasant Valley Ry.	25	1,400,000	1,400,000	2 1/2 %	27	29
hPgh., Allegheny & Man. Trac. Co.	50	8,000,000	8,000,000	2 % Aug.	—	—
iPittsburg & Birmingham Trac. Ry.	25	1,500,000	1,500,000	1 %	—	—
jPittsburg & West End Ry.	50	8,000,000	8,000,000	5 % A., June	41	42 1/2
kUnited Traction Co.	50	17,000,000	17,000,000	J. & J.	18 1/2	18 1/2
lUnited Traction Co., pref.	50	8,000,000	8,000,000	J. & J.	61 1/2	62

* Unlisted. † Ex div.
 a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.
 b Leased to Boston Elevated Railroad Company.
 c Owned by Brooklyn Rapid Transit Company.
 d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.
 e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.
 f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.
 g Owned by Atlantic Ave. RR. and leased to Nassau system.
 h \$20 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.; \$250 100 of stock owned by North Chicago Street Railroad Company.
 i Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.
 j 5% per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company; \$625,100 of stock owned by West Chicago Street Railroad Company.
 k Majority of stock owned by Chicago West Division Railway Company; 5% on \$1,000,000 stock guaranteed by West Chicago Street Railway Company, lessee.
 l Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming 1 1/2 bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex-div.
 a Leased to New Orleans Traction Company at 6 % on stock.
 b Leased to New Orleans Traction Company at 8 % on stock.
 c Leased to Central Crostown Railroad at 8 % on stock and interest on bonds.
 d Operating the former Met. Trac. system, that corporation having become extinct.
 e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.
 f Leased to Houston, West Street & Pavyon Ferry—now Metropolitan Street Railway.
 g Leased to Metropolitan Street Ry. at 8 % on stock until Oct. 1, 1897; thereafter 9 %.
 h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1895, at \$215,000 per annum.
 i Leased to Met. St. Ry. for 18 % on stock.
 j Leased to Met. St. Ry. for 99 years from April 21, 1892; 6 % first 5 years, 8 % thereafter.
 k Leased to Metropolitan Street Railway for \$145,000 per annum.
 l Leased to Metropolitan Street Railway for 18 % on capital stock.
 m Controlled by Third Avenue Railroad by purchase.
 n Dividends of 1 1/2 % yearly guaranteed by Consolidated Traction Company.
 o Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.
 p Leased to Consolidated Traction Company for 8 % per annum on par value of stock.
 q Leased to Fort Pitt Traction Company for 6 % on \$8,000,000 capital stock.
 r Leased to Consolidated Traction Company for 4 % on capital stock.
 s Leased to Consolidated Traction Company for 7 % on capital stock.

PASSENGER RAILWAYS.

TELEPHONE AND TELEGRAPH COS.

NAME.	Par	Capital Stock.		Rate and Date of Last Div.	Bid.	Asked.	NAME.	Par	Capital Stock.		Rate and Date of Last Div.	Bid.	Asked.
		Author'd	Issued.						Author'd	Issued.			
New Bedford Mass. —June 24													
Union Street Railway Co.	100	\$850,000	\$850,000	2 % Feb.	160	165							
Northampton, Mass. —June 24													
Northampton Street Ry.	100	800,000	225,000	4 % A., June.	170	178							
Omaha, Neb. —June 24													
Omaha Street Ry.	100	5,000,000	5,000,000	8 % A. and N.	55	65							
Paterson N. J. —June 24													
Paterson Ry. Co.	100	1,250,000	1,250,000		54	—							
Providence, R. I. —June 24													
United Traction & Electric Co.	100	8,000,000	8,000,000	3 % Oct.	109	110							
Philadelphia. —June 24													
Fairmount Park Trans. Co.	50	2,000,000	1,770,000	2 % Dec.	28	24							
Hestonville, Man. & Fairmount.	50	1,966,100	1,966,100	2 1/2 % July 15,	47	48							
Hestonville, Man. & Fairm't. 6 % pfd.	50	588,900	588,900	8 % 8—July,	75	76							
a Fairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	8 % Feb. 1,	27 1/2	28							
Union Traction Co.	50	80,000,000	29,980,450		30	30 1/2							
Electric Traction Co.	50		8,297,920		445	—							
d Citizens' Passenger Ry.	50	500,000	192,500	8 share Q.	450	451							
e Frankford & Southwark Pas. R.	50		1,875,000	14 share A—Apr.	48	—							
f Lehigh Avenue Ry. Co.	50	1,000,000			90	90 1/2							
g Lombard & South Street Ry.	25		1,000,000	A. & O.	300	—							
h Second & Third Streets Ry.	50	1,000,000	771,076	30 share A, Mar.	150	151							
i People's Traction Co.	50	10,000,000	6,000,000	8 % A., April,	151	152							
j Germantown Passenger Ry.	50	1,500,000	572,800	35.25 share—	151	152							
k Green & Coates Passenger Ry.	50	500,000	150,000	8 % Jan.,	95	95 1/4							
l People's Passenger Ry. com.	25	1,500,000	740,000		—	—							
m People's Passenger Ry. pfd.	25	750,000	277,402		—	—							
n Philadelphia Traction Co.	50	30,000,000	120,000,000	\$2 p. sh. Oct.	158	157							
o Catherine & Bainbridge St.	50		400,000	6 % A—Mar.	108	107							
p Continental Pass. Ry. guar.	50	1,000,000	580,000	8 share—July	108	108							
q Empire Passenger Ry. Co.	50	600,000	600,000		108	208 1/2							
r Philadelphia City Pass. Ry.	50	1,000,000	475,000	37.50 share July	100	100							
s Philadelphia & Gray's Ry. RR.	50	1,000,000	298,650	88.50 share July	100	809							
t Bridge Avenue Passenger Ry.	50	750,000	420,000	12 share July,	100	—							
u Philadelphia & Dart. Ry. guar.	50		200,000	32 share July,	—	—							
v 15th & 19th Sts. Pass. Ry. guar.	50		250,000	1 % S., July,	800	—							
w Thirteenth & 15th Sts. Pass. Ry.	50	1,000,000	885,000	11 sh. A., July,	149	240							
x Union Passenger Ry. Co.	50	1,500,000	900,000	39.50 shre, July,	262	268							
y West Philadelphia Pass. Ry.	50	750,000	750,000	\$10 share, July,	—	—							
Rochester, N. Y. —June 24													
Rochester Railway Co.	100	5,000,000	5,000,000		25	28							
Reading, Pa. —June 24													
Reading Traction Co.	50	1,000,000	1,000,000	Semi-an., Jan. & Jy	24	26							
City Passenger Ry.	50	850,000	850,000	Jan.,	138	—							
East Reading Electric Ry.	50	1,060,000	1,000,000	Jan.,	70	—							
St. Louis Mo. —June 24													
Fourth Street & Arsenal Ry.	50	800,000	150,000		—	—							
Jefferson Avenue Ry. Co.	50	400,000	400,000	2 % Dec.	—	—							
Lindell Ry.	100	2,500,000	2,400,000	1 1/2 % Jan.	—	—							
National Railway Co.	100	2,500,000	2,479,000	1 1/2 % Jan.	—	—							
Cass Avenue & Fair Grounds.	100	2,500,000	2,500,000		—	—							
Citizens' RR.	100	2,000,000	1,500,000	4 % Oct.	—	—							
St. Louis RR.	100	2,000,000	2,000,000	2 1/2 % Jan.,	—	—							
Missouri RR.	50	2,400,000	2,800,000	1 1/2 % Jan.,	—	—							
People's RR. Co.	50	1,000,000	800,000	50c, Dec.,	24	25							
United Electric Ry.	50	500,000	500,000		78 1/2	79							
United Electric Ry.	50	1,000,000	1,000,000	8 % Jan.,	90	93							
t. Louis & Suburban Ry.	100	800,000	2,500,000		—	—							
Union Depot RR.	100	4,000,000	4,000,000	8 % A., July,	—	—							
San Francisco, Cal. —June													
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119							
Geary Street Park & Ocean RR.	100	1,000,000	875,000	\$2.50 share,	60	—							
Market Street Ry.	100	18,750,000	18,750,000	Q., 60c. per share.	61 1/2	68 1/2							
Presidio & Ferries RR.	100	1,000,000	550,000		—	16							
Scranton Pa. —June 24													
Scranton Railway Co.	50	6,000,000	2,500,000		29	30							
m Scranton & Carbondale Trac. Co.	100	500,000	500,000		16 1/2	—							
n Scranton & Pittston Traction Co.	100	1,050,000	1,050,000		—	—							
Springfield Ill. —June 24													
Springfield Consolidated Ry.	100	750,000	750,000		—	—							
Springfield O. —June 24													
Springfield Street Ry.	100	1,000,000	1,000,000		—	11							
Springfield, Mass. —June 24													
Springfield Street Ry.	100	1,200,000	1,166,700	8 % A.	207	212							
Toronto Canada. —June 24													
Toronto Street Ry.	100	6,000,000	6,000,000	1 1/2 % B.	109 1/2	110 1/2							
Montreal Street Railway Co.	100	4,000,000	4,000,000	4 % B.	279	280							
Washington, D. C. —June 24													
Belt Ry. Co.	50	500,000	500,000		103 1/2	—							
Capital Traction Co.	100	12,000,000	12,000,000	60c. per sh. Oct.	103 1/2	103 1/2							
Columbia Ry. Co.	50	400,000	400,000	6 % A.	35	40							
Edgington & Soldiers' Home Ry.	50	707,000	652,000		20	21							
Georgetown & Tenallytown Ry.	50	200,000	200,000		—	—							
Metropolitan RR. Co.	50	1,000,000	468,900	2 1/2 % Q.	—	—							
Worcester, Mass. —June 24													
Worcester Traction Co.	100	8,000,000	8,000,000		8 1/2	25							
Worcester Traction Co. 6 % pfd.	100	2,000,000	2,000,000	8 % S., Feb.,	107	108							
Worcester & Suburban Street Ry.	100	550,000	542,500	4 % Q.	—	85							
Wilkesbarre, Pa. —June 24													
Wilkesbarre & Wyoming Val Trac.	100	5,000,000	5,000,000	1 % J. 1,	25	26							
Boston, Mass. —June 24													
American Tel. & Tel. Co.	100	80,000,000	28,850,000	4 1/2 % Q. Jan.	159	159 1/4							
Erie Telegraph & Telephone Co.	100		10,894,600	1 % Q., Feb. 20,	85	85 1/4							
New England Telephone Co.	100	10,894,600	10,894,600	\$1.50 p. sh. Feb	141	141							
New York. —June 24													
American Telegraph & Cable Co.	100	14,000,000	14,000,000	1 1/2 % Q.	91	94							
*Central & South Am. Tel. Co.	100	6,500,000	6,500,000	1 1/2 % Q.	100	105							
*Commercial Cable Co.	100	10,000,000	10,000,000	1 1/2 % Q.	178	175							
Franklin Tel. Co.	100	1,000,000	1,000,000	1 1/2 % S.	42	50							
Erie Telegraph & Telephone Co.	100	5,000,000	4,800,000	1 % Q. Feb.,	—	—							
*Gold & Stock Tel. Co. guar. 6 %	100	5,000,000	5,000,000	1 1/2 % Q.	108	109							
*International Ocean Tel. Co. guar. 6 %	100	8,000,000	8,000,000	1 1/2 % Q.	116	114							
Mexican Telephone Co.	100	2,000,000	2,000,000		3	8							
*New York & New Jersey Tel. Co.	100	5,000,000	3,728,000	2 1/2 % Q., Jan.,	168	178							
*Pacific & Atlantic Tel. Co. guar. 4 %	25	2,000,000	2,000,000	2 % S.	70	75							
*Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1 % Q.	—	—							
*South & Atlantic Tel. Co. guar. 5 %	25	950,000	559,525	2 1/2 % S.	95	100							
*Commercial Union Telegraph Co.	25	500,000	500,000	8 % S., Jan.,	115	—							
Western Union Telegraph Co.	25	97,370,000	97,370,000	1 1/2 % Q. Jan.	93 1/2	93 1/2							
*Div. guar. by Postal Tel. Co.	100				—	—							
Miscellaneous. —June 24													
American Dist. Tel. (Phila.)	25	400,000	400,000	1 % Q.	26	27							
Bell Teleph. Co. (of Canada.)	100	8,960,000	8,561,000	2 % S.	188	—							
Chesapeake & Potomac Tel. Co.	100	100,000	100,000		200	110							
Chicago Telephone Co.	100	750,000	750,000		148	150							
Central Dist. Frig. & Tel. Co. (Phg.)	100	750,000	750,000		76	76							
Empire & Bay States Telephone Co.	109	2,000,000	2,000,000	1 % Q.	120	125							
Hudson River Telephone Co.	50	2,500,000	2,500,000	2 1/2 % Q.	122	125							
*Northwestern Telephone Co. guar.	50	8,000,000	8,000,000		56	59							
Providence (R. I.) Teleph. Co.	100				—	—							
Southern New Eng. Tel. Co.	100				—	—							
ELECTRIC LIGHT AND ELECTROCAL MFG. CO.													
Boston, Mass. —June 24													
Fort Wayne Electric trust receipts.	25				115	125							
ft. Wayne Elec. Co. T. Sec. Series A.	25				15	25							
*General Electric Co. (old) com.	100	40,000,000	40,460,000	2 % Q., Aug., 1898.	266	266 1/4							
General Electric Co. (new) com.	100	18,276,000	18,276,000	1 1/2 % Q., Apr., 1901	266	266 1/4							
T. H. Elec. Co. T. Secur., Series C.	100				26	25							
Westinghouse Elec. & Mfg. Co. com.	50		146,700		70	70 1/2							
Westinghouse El. & Mfg. Co. pfd.	50	4,000,000	3,998,058	1 1/2 % Q., Jan.,	78 1/2	78 1/2							
Westinghouse El. & Mfg. Co. rights.	50	11,000,000	8,195,126		134	134							
New York. —June 24													
Edison Elec. Ill'g Co., New York.	100	9,188,000	7,388,000		119	120							
*Edison Elec. Ill'g Co., Brooklyn.	100	4,000,000	2,000,000	1 % Q. Oct., '98.	8	12							
Edison Ore Milling Co.	100				—	—							
Electric Vehicle Co.	100												

BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

NAME.		Amount.		Due	Interest periods.	Bid.	Asked.	NAME.		Amount.		Due	Interest periods.	Bid.	Asked.
Authorized.	Issued.	Authorized.	Issued.												
Albany N. Y.															
Date of Quotation—June 24, 1901															
The Albany Ry. Co. Cons. mtg. 5s	\$500,000	427,500	1940	J. & J.	117½	.....	.....	Canal & Claiborne RR. Cons. mtg. 5s	\$180,000	\$150,000	1912	M. & N.	.....	.....	.....
The Albany Ry. Co. Gen. mtg. 5s	750,000	575,000	1947	M. & N.	118½	.....	.....	Crescent City RR. Cons. mtg. 5s	5,000,000	2,000,000	1948	J. & J.	.....	.....	.....
Watervliet Turnpike & RR. 1st mtg. 5s	850,000	850,000	1919	M. & N.	125	.....	.....	New Orleans City RR. Cons. mtg. 5s	416,500	399,000	1908	J. & D.	108	112	.....
Watervliet Turnpike & RR. 2d mtg. 5s	150,000	150,000	1919	M. & N.	124	176	.....	N. Orleans City & Lake RR. 1st mtg. g. 5s	5,000,000	2,325,000	1948	J. & J.	112	118	.....
Troy City Railway Co. 1st 5s	.....	.....	1942	.....	116	117	.....	N. Orleans & Carrollton RR. 2d mtg. g. 5s	800,000	800,000	1907	F. & A.	.....	.....	.....
Interest guar. by Albany Ry. Co. Principal and interest guar. by Albany Ry. Co.															
Baltimore Md.															
Date of Quotation—June 24, 1901															
United Electric Ry. Co. 1st mtg. g. 4s	\$8,000,000	18,000,000	1940	M. & S.	102	102½	.....	Atlantic Ave. (Brooklyn) Imp. g. 5s	1,800,000	1,800,000	1904	J. & J.	95	.....	.....
..... Income 4s	14,600,000	.....	1949	J. & D.	74½	75	.....	Atlantic Ave. (Brooklyn) 1st mtg. 5s	799,000	799,000	1909	M. & S.	107½	110	.....
Baltimore City Pass. Ry. 1st mtg. g. 5s	2,000,000	2,000,000	1911	M. & N.	118½	.....	.....	Atlantic Ave. (Brooklyn) Cons. mtg. 5s	2,000,000	1,945,000	1901	A. & O.	115	116	.....
Baltimore Traction Co. 1st mtg. 5s	1,500,000	1,500,000	1929	M. & N.	119	120	.....	Bro'dway & 7th Ave. 1st cons. mtg. g. 5s	12,800,000	7,600,000	1948	J. & D.	128	128	.....
Baltimore Trac. Co. Exten. & Imp. g. 5s	1,250,000	1,250,000	1901	M. & S.	104½	.....	.....	Bro'dway & 7th Ave. 2d mtg. 5s	1,800,000	1,800,000	1904	J. & D.	104	108½	.....
Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121½	.....	Broadway & 7th Ave. 1st mtg. 5s	500,000	500,000	1914	J. & J.	108	110	.....
Bal. Trac. Co. Coll. Trust 1st mtg. g. 5s	750,000	.....	1900	J. & J.	101	.....	.....	Broadway Surface 1st mtg. 5s	1,125,000	1,125,000	1924	.....	115	117	.....
Baltimore Traction Co. Convertible 5s	800,000	.....	1906	N. & M.	102½	.....	.....	Broadway Surface 2d mtg. 5s	1,000,000	1,000,000	1905	.....	108	108	.....
Central Pass. Ry. Co. 1st mtg. 5s	96,000	117,000	1912	J. & J.	.....	.....	.....	Brooklyn City RR. Co. 1st cons. mtg. 5s	6,000,000	6,000,000	1941	J. & J.	116	117	.....
Central Pass. Ry. Co. Cons. mtg. g. 5s	604,000	580,000	1902	M. & N.	119	121	.....	Brooklyn City & Newtown 1st mtg. 5s	2,000,000	2,000,000	1909	J. & J.	115	116	.....
City & Suburban Ry. 1st mtg. g. 5s	8,000,000	8,000,000	1922	J. & D.	116	117	.....	Brooklyn Bath & W.E. RR. Gen. mtg. 5s	1,000,000	448,000	1903	J. & J.	101	.....	.....
Lake Roland Elev. 1st mtg. 5s	1,000,000	1,000,000	1942	M. & S.	117	.....	.....	Brooklyn Heights RR. 1st mtg. 5s	250,000	250,000	1941	A. & O.	104	.....	.....
All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.															
Boston Mass.															
Date of Quotation—June 24, 1901															
Lynn & Boston RR. 1st mtg. g. 5s	5,379,000	3,708,000	1904	J. & D.	114	115	.....	Dry Dock, E. Bd'y & Bat'y R. gen. mtg. g. 5s	1,000,000	1,100,000	1914	F. & A.	108	108	.....
West End Street Ry. Deben. g. 5s	8,000,000	3,000,000	1902	M. & N.	104½	106	.....	Elgin Ave. RR. Co. Cert. indebt. 6%	200,000	1,200,000	1910	M. & S.	116½	117	.....
West End Street Ry. Deben. g. 4½s	2,000,000	2,000,000	1914	M. & S.	112	.....	.....	43d St. Man. & St. Nich. Av. 1st mtg. 5s	1,500,000	1,500,000	1915	J. & J.	95	.....	.....
†\$1,074,000 in escrow to retire outstanding bonds of absorbed companies.															
Charleston S. C.															
Date of Quotation—June 24, 1901															
Enterprise Street RR. 1st mtg. 5s	500,000	47,000	1906	J. & J.	.....	.....	.....	Lex. Ave. & Pav. Ferry RR. 1st mtg. g. 5s	5,000,000	5,000,000	1908	M. & S.	124	125	.....
Charleston City Ry. 1st mtg. 5s	850,000	.....	.....	J. & J.	106	.....	.....	Metropolitan St. Ry. Co. g. m. el. tr. g. 5s	12,500,000	17,800,000	1907	F. & A.	120	.....	.....
†Controlled by Charleston St. Ry. Co.															
Chicago Ill.															
Date of Quotation—June 24, 1901															
Chicago City Ry. 1st mtg. 4½s	6,000,000	4,619,500	1901	J. & J.	101½	102½	.....	Second Avenue Ry. Gen. cons. mtg. 5s	1,600,000	1,600,000	1909	M. & N.	120	120	.....
Chicago Passenger Ry. 1st mtg. 5s	400,000	.....	1906	F. & A.	.....	102	.....	Second Avenue Ry. Gen. cons. mtg. 5s	800,000	800,000	1909	J. & J.	108½	109	.....
Chicago Passenger Ry. Cons. mtg. 5s	1,000,000	600,000	1929	J. & D.	.....	.....	.....	Steinway Ry. (L. I.) 1st mtg. g. 5s	1,500,000	1,500,000	1922	J. & J.	116	117	.....
Chicago & So. Side R. T. 1st mtg. g. 5s	7,500,000	7,500,000	1929	A. & O.	.....	.....	.....	South Ferry RR. Co. 1st mtg. 5s	850,000	800,000	1912	J. & J.	110½	112½	.....
Chicago & So. Side R. T. 2d mtg. 5s	1,500,000	750,000	1907	J. & J.	.....	.....	.....	Third Avenue RR. 1st mtg. g. 5s	5,000,000	5,000,000	1907	J. & J.	.....	120½	.....
Chicago West Div. Ry. 1st mtg. 4½s	4,040,000	4,040,000	1902	J. & J.	108½	109	.....	Twenty-third Street Ry. 1st mtg. 5s	.....	.....	1909	J. & J.	.....	.....	.....
Lake Street Elevated RR. 1st mtg. g. 5s	7,574,000	8,781,200	1926	J. & J.	.....	.....	.....	Twenty-third Street Ry. Deb. 5s	150,000	150,000	1906	J. & J.	106	106	.....
Metrop. W. Side Elev. Ry. 1st mtg. g. 5s	15,000,000	15,000,000	1926	J. & J.	.....	.....	.....	Union (Huekleberry) Ry. 1st mtg. 5s	2,000,000	2,000,000	1942	F. & A.	118	118	.....
North Chicago St. RR. 1st mtg. 5s	8,171,000	8,171,000	1906	J. & J.	106	.....	.....	Westchester Electric RR. 1st mtg. 5s	500,000	500,000	1948	J. & J.	110	114	.....
North Chicago St. RR. Cert. indebt. 5s	500,000	500,000	1911	J. & J.	.....	.....	.....	†\$1,085,000 in escrow to retire gen. mtg. bonds. 1942, 500,000 in escrow to retire maturing obligations. 1902, 500,000 in escrow to retire 1st and 2d mtg. bonds. In treasury, \$30,000. Guar. by Union Ry. Co.							
North Chicago City Ry. 1st mtg. 5s	500,000	500,000	1900	J. & J.	.....	.....	.....	Toronto Canada.							
North Chicago City Ry. Consol. 4½s	2,500,000	2,500,000	1907	M. & N.	108	.....	.....	Date of Quotation—June 24, 1901							
West Chicago St. RR. 1st mtg. 4½s	4,100,000	3,969,000	1928	M. & N.	.....	.....	.....	Montreal St. Ry. 1st mtg. 5s	2,500,000	800,000	1908	M. & S.	.....	.....	.....
West Chicago St. RR. Debent. 5s	2,700,000	700,000	1911	J. & D.	101	102	.....	Toronto St. Ry. 1st mtg. g. 4½s	4,500,000	2,300,000	1921	M. & S.	.....	.....	.....
West Chicago St. RR. Cons. mtg. g. 5s	12,500,000	6,000,000	1909	F. & A.	105½	107	.....	1905, 500 per m. single track authorized. \$500,000 in escrow to retire 5s due in 1901.							
W. Chicago St. RR. Tunnel. 1st mtg. 5s	1,500,000	1,500,000	1909	F. & A.	.....	.....	.....	Philadelphia.							
Redeemable at option on 60 da. notice	.....	.....	.....	.....	.....	.....	.....	Date of Quotation—June 24, 1901							
Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.	.....	.....	.....	.....	.....	.....	.....	Continental Pass. Ry. 1st mtg. 5s	850,000	810,000	1909	J. & J.	.....	.....	.....
Subject to call after Oct. 1, 1899, at \$110 and interest.	.....	.....	.....	.....	.....	.....	.....	Empire Pass. Ry. 1st mtg. 7s	800,000	300,000	1900	J. & J.	.....	.....	.....
Assumed by W. Chi. RR. Co., lessee.	.....	.....	.....	.....	.....	.....	.....	Greene & Coates St. Ry. 1st mtg. 5s	100,000	100,000	1898	J. & J.	.....	.....	.....
Int. guar. by W. Chicago St. RR. Co.	.....	.....	.....	.....	.....	.....	.....	Lombard & So. St. Pass. Ry. 1st mtg. 5s	150,000	.....	1901	.....	.....	.....	.....
Cincinnati O.															
Date of Quotation—June 24, 1901															
Oin. New & Cov. St. Ry. 1st Con. mtg. g. 5s	5,000,000	2,500,000	1922	J. & J.	114½	115	.....	People's Pass. Ry. 1st mtg. 7s	280,000	250,000	1905	J. & J.	.....	.....	.....
Mt. Adams & Eden Pk In. 1st mtg. 5s	46,000	46,000	1900	A. & O.	108½	104	.....	People's Pass. Ry. 2d mtg. 5s	500,000	458,000	1911	J. & J.	.....	.....	.....
Mt. Adams & Eden Pk In. 1st mtg. 6s	100,000	100,000	1905	A. & O.	114	.....	.....	People's Pass. Ry. Cons. mtg. 5s	1,125,000	897,000	1912	M. & S.	.....	.....	.....
Mt. Adams & Eden Pk Inc. Cons. mtg. 5s	581,000	581,000	1906	M. & S.	108½	122½	.....	People's Pass. Ry. Stk. trs. cert. g. 4s	5,000,210	.....	1910	J. & J.	.....	.....	.....
So. Cov. & Oin. St. Ry. 1st mtg. 6s	250,000	250,000	1912	M. & S.	121½	187	.....	Phila. City Passenger Ry. 1st mtg. 5s	200,000	200,000	1917	F. & A.	.....	.....	.....
So. Cov. & Oin. St. Ry. 2d mtg. 6s	400,000	400,000	1902	J. & J.	180½	.....	.....	Philadelphia Trac. Co. Coll. tr. g. 4s	1,800,000	1,018,000	1908	A. & O.	.....	.....	.....
†Assumed by the Cincin. St. Ry. Co. 1900,000 reserved to retire 1st mtg. bds.															
Cleveland O.															
Date of Quotation—June 24, 1901															
Brooklyn Street RR. Co. 1st mtg. 5s	600,000	600,000	1908	M. & S.	108½	107	.....	Thirteenth & 15th St. Ry. 1st mtg. 7s	100,000	100,000	1908	A. & O.	.....	.....	.....
Oin. New & Cov. St. Ry. Cons. mtg. 5s	8,000,000	2,500,000	1922	J. & J.	118½	114½	.....	Union Passenger Ry. 1st mtg. 5s	500,000	500,000	1911	A. & O.	.....	.....	.....
Cleveland City Cable Ry. 1st mtg. 5s	2,000,000	2,000,000	1909	J. & J.	106	106	.....	Union Traction Co. Col. tr. 4s	29,785,000	29,724,876	1905	.....	.....	.....	.....
Cleveland Electric Ry. Co. 1st mtg. g. 5s	8,500,000	1,249,000	1918	M. & S.	.....	.....	.....	West End Passenger Ry. 1st mtg. 7s	.....	.....	1906	A. & O.	.....	.....	.....
Columbus (O.) Cent. Ry. 1st mtg. g. 5s	1,500,000	1,500,000	1910	M. & N.	.....	.....	.....	West Phila. Pass. Ry. 1st mtg. g. 5s	250,000	245,000	1906	A. & O.	.....	.....	.....
East Cleveland RR. 1st mtg. 5s	1,000,000	1,000,000	1912	M. & S.	.....	.....	.....	West Phila. Pass. Ry. 2d mtg. 5s	750,000	750,000	1906	M. & N.	.....	.....	.....
Fl. Wayne (Ind.) Elec. Ry. 1st mtg. g. 5s	600,000	.....	1922	M. & N.	.....	.....	.....	The trust certificates were issued to pay for the shares of the Electric and People's Traction lines purchased.							
Lorain (O.) Street Ry. 1st mtg. 5s	200,000	200,000	1915	J. & J.	.....	.....	.....	Pittsburg Pa.							
St. Ry. Co. Grand Rapids. 1st mtg. 5s	600,000	600,000	1912	J. & D.	.....	.....	.....	Date of Quotation—June 24, 1901							
†\$1,900,000 in escrow to retire bonds of absorbed companies, marked a.															
Interest guar. by Cons. St. Ry. Co.															
Detroit, Mich.															
Date of Quotation—June 24, 1901															
Detroit Citizens' St. Ry. 1st mtg. 5s	7,000,000	8,885,000	1905	A. & O.	.....	102½	.....	Birmingham, Knox & Allentown 5s	500,000	500,000	1901	M. & S.	111½	.....	.....
Fl. Wayne & Belle Isle Ry. 1st mtg. 5s	400,000	377,000	1908	A. & O.	.....	.....	.....	Central Traction Co. 1st mtg. 5s	875,000	875,000	1920	J. & J.	.....	.....	.....
The Detroit Ry. 1st mtg. 5s	1,800,000	1,800,000	1925	J. & D.	105	105½	.....	Citizens' Traction Co. 1st mtg. 5s	1,250,000	1,250,000	1927	A. & O.	.....	.....	.....
†\$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.															
New Haven Conn.															
Date of Quotation—June 24, 1901															
New Haven St. Ry. 1st mtg. g. 5s	600,000	600,000	1912	J. & J.	111	.....	.....	*Duquesne Traction Co. 1st mtg. 5s	1,500,000	1,500,000	1900	J. & J.	.....	.....	.....
New Haven (Edgewood Div.) 1st mtg. 5s	250,000	250,000	1914	J. & D.	111	.....	.....	*Fed'l St. & Pleas. Val. Jack's Run. 5s	50,000	50,000	1918	J. & J.	.....	.....	.....
Hoghtester Avenue RR. 1st mtg. g. 5s	100,000	500,000	1912	M. & S.	109	.....	.....	Fed'l St. & Pleasant Valley Cons. 5s	1,250,000	1,250,000	1942	J. & J.	.....	.....	.....
Hoghtester Avenue RR. Debent. g. 5s	100,000	24,000	1922	M. & S.	.....	.....	.....	Millvale, Etna & Sharpsburg 5s	750,000	750,000	1928	M. & N.	110	110	.....
Interest guar. by Cons. St. Ry. Co.															
Providence R. I.															
Date of Quotation—June 24, 1901															
Newport Street Ry. 1st mtg. 5s	50,000	50,000	1910	J. & D.	.....	.....	.....	Pittsburg & Crafton & Mansfield 5s	250,000	250,000	1924	J. & J.	.....	.....	.....
United Trac. & Elec. Co. 1st mtg. g. 5s	9,000,000	8,300,000	1908	M. & S.	116	118	.....	Pittsburg Traction Co. 1st mtg. 5s	750,000	750,000	1927	A. & O.	.....	.....	.....
St. Louis.															
Date of Quotation—June 24, 1901															
Baden & St. Louis RR. 1st mtg. 5s	350,000	250,000	1912	J. & J.	101½	102½	.....	Pittsburg & Birmingham 1st mtg. 5s	1,500,000	1,500,000	1929	M. & N.	112	113	.....
Cass Ave. & Fair Gds Ry. 1st mtg. 5s	1,818,000	1,818,000	1922	J. & J.	101½	102½									

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bid.	Asked
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—June 24 1901.						
Jefferson Avenue Ry.....1st mtg. 6s.	270,000	270,000	1905	M. & N.	102	118
Lindell Ry. Co.....1st mtg. 6s.	1,500,000	1,500,000	1911	F. & A.	107	118
Missouri RR. Co.....1st mtg. 6s.	1,000,000	700,000	1916	M. & S.	105	106
Union City RR. Co.....1st mtg. 6s.	400,000	800,000	1910	A. & O.	104½	105½
People's RR. Co.....1st mtg. 6s.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....2d mtg. 7s.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....Cons. mtg. 6s.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric 1st mtg. 6s.	75,000	75,000	1906	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 6s.	2,000,000	2,000,000	1900	M. & N.	99½	100½
St. Louis & Sub. Ry.....1st mtg. g. 5s.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....Income 6s.	800,000	800,000	.....	.....	80	84
St. Louis & Sub. Ry.....Cons. mtg. 6s.	500,000	500,000	1909	M. & N.	106	108
Southern Electric Ry.....Cons. mtg. 6s.	500,000	500,000	1918	J. & J.	116½	117½
Taylor Avenue St. Ry.....1st mtg. g. 5s.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.....1st cons. mtg. 6s.	8,500,000	1,787,000	1918	J. & J.	121	122
Union Depot RR. Co.....Cons. mtg. 6s.	.....	.....	.....	.....	.....	.....
†Controlled by St. Louis RR. Co.	.....	.....	.....	.....	.....	.....
†Controlled by Union Depot RR. Co.	.....	.....	.....	.....	.....	.....
†Controlled by Lindell RR. Co.	.....	.....	.....	.....	.....	.....
†\$200,000 in escrow to retire 1st & 2d mtg. bds.	.....	.....	.....	.....	.....	.....
†\$500,000 in escrow.	.....	.....	.....	.....	.....	.....
†\$200,000 in escrow to retire 1st mtg. bds.	.....	.....	.....	.....	.....	.....
San Francisco Cal.						
Date of Quotation—June 1901.						
California St. Cable RR.....1st mtg. g. 5s.	1,000,000	900,000	1915	J. & J.	114	117
Ferries & Cliff House Ry.....1st mtg. 6s.	550,000	550,000	1914	M. & S.	.....	117
Gerry St., Park & Ocean RR.....1st mtg. 6s.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. g. 5s.	8,000,000	8,000,000	1918	J. & J.	126½	.....
Metropolitan Ry. Co.....1st mtg. 6s.	200,000	.....	.....	.....	.....	.....
Omnibus Cable Co.....1st mtg. 6s.	2,000,000	2,000,000	1918	A. & O.	126½	.....
Park & Cliff House RR.....1st mtg. 6s.	850,000	850,000	1912	J. & J.	105½	107
Park & Cliff House RR.....2d mtg. 6s.	250,000	250,000	1914	J. & J.	115	.....
Park & Ocean RR.....1st mtg. 6s.	700,000	700,000	1912	M. & S.	.....	125
Powell St. Ry.....1st mtg. 6s.	1,000,000	900,000	1918	M. & N.	.....	.....
Utter St. Ry. Co.....1st mtg. g. 5s.	.....	.....	.....	.....	.....	.....
†Controlled by Market St. Ry. Co.	.....	.....	.....	.....	.....	.....
Washington D. C.						
Date of Quotation—June 24, 1901						
Belt Ry. Co.....Cons. mtg. 6s.	500,000	450,000	1920	J. & J.	.....	.....
Columbia Ry.....1st mtg. 6s.	500,000	500,000	1914	A. & O.	132	.....
Eckington & Soldiers' Home Ry.....1st mtg. 6s.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 6s.	500,000	500,000	1901	J. & J.	.....	.....
†\$50,000 in escrow to retire 1st mtg. bds.	.....	.....	.....	.....	.....	.....
Miscellaneous						
Date of Quotation—June 24, 1901						
Bridgeport Traction Co.....1st mtg. 6s.	2,000,000	1,688,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 6s.	5,000,000	8,548,000	1981	F. & A.	118	.....
Chittenden St. Ry. (Ind. polls) 1st cons. m. 5s.	4,000,000	8,000,000	1988	M. & N.	104	105
Cross-town St. Ry. (Buffalo) 1st mtg. 6s.	8,000,000	2,366,000	1982	M. & N.	112	118
Columbus (O.) St. Ry. 1st cons. g. 5s.	8,000,000	2,261,000	1982	J. & J.	115	.....
Consolidated Traction (N. J.) 1st mtg. 6s.	15,000,000	18,965,000	1983	J. & D.	111½	111½
Cross'n St. Ry. (Columb., O.) 1st mtg. g. 5s.	2,000,000	572,000	1983	J. & D.	115	115½
Denver City Cable Ry.....1st mtg. g. 6s.	4,000,000	8,800,000	1920	J. & J.	80	85
Denver Con. Tram'g Co. Cons. m. g. 5s.	4,000,000	922,000	1988	A. & O.	80	85
Louisville (Ky.) Ry. 1st cons. mtg. g. 5s.	6,000,000	4,981,000	1980	J. & J.	119	119½
Minneapolis St. Ry. 1st cons. mtg. g. 5s.	5,000,000	4,050,000	1919	J. & J.	110½	110½
No. Hudson Co. Ry. (N. J.) Cons. mtg. 6s.	8,000,000	2,878,000	1928	J. & J.	108	.....
No. Hudson Co. Ry. (N. J.) 2d mtg. 6s.	550,000	550,000	1928	M. & N.	.....	.....
No. Hudson Co. Ry. (N. J.) Deb. 6s.	500,000	489,000	1902	F. & A.	.....	.....
Paterson (N. J.) Ry. Cons. mtg. g. 6s.	1,250,000	1,000,000	1981	J. & D.	.....	.....
Rochester (N. Y.) Ry. 1st mtg. 6s.	8,000,000	2,000,000	1980	A. & O.	.....	.....
St. Paul City Ry.....Cons. g. 5s.	5,500,000	4,298,000	1987	.....	105½	106
St. Paul City Ry.....Deb. g. 6s.	1,000,000	1,000,000	1900	.....	108	.....
†\$1,000,000 in escrow to retire 1st and 2d mtg. bds.	.....	.....	.....	.....	.....	.....
†\$800,000 in treasury. Bonds guar. by Buffalo Ry. Co.	.....	.....	.....	.....	.....	.....
†\$760,000 in escrow to retire bonds of C. St. RR. Co.	.....	.....	.....	.....	.....	.....
†\$87,000 in treasury.	.....	.....	.....	.....	.....	.....
†\$960,000 reserved to redeem prior liens	.....	.....	.....	.....	.....	.....
†\$820,000 in escrow.	.....	.....	.....	.....	.....	.....
*With Int'r						

*With int' res

ELECTRIC LIGHT AND ELECTRICAL MFG. COOS

Boston, Mass.						
Date of Quotation—June 24, 1901						
Delaware Gas Lt. Co.....1st m. 5s. g.	800,000	800,000	.....	J. & J.	106	108
Edison Elec. Illuminating Co., Boston.	2,028,000	.....	.....	Quar.	117	.....
General Electric Co. gold coup. deb. 6s.	10,900,000	8,750,000	1922	.....	116	.....
Pittsburg Pa.						
Date of Quotation—June 24, 1901						
Allegheny County Light Co.....6s.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Electric & Mfg. Co. Scrip 6s.	195,570	.....	.....	M. & S.	.....	.....
Miscellaneous. —(June 24 1901.)						
Edison El. Illg. Co. (N. York) 1st m. 5s.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Illg. Co. (N. Y.) con. m. g. 5s.	15,000,000	2,188,000	1998	.....	124	.....
Edison El. Illg. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122½	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Pow. Co. 1st mtg. 6s.	2,500,000	.....	1987	A. & O.	100	105
Kings Co. El. Lt. & Pow. Co. pur. money 6s.	5,176,000	.....	1997	A. & O.	120	122
Milwaukee El. Ry. & Lt. Co. 1st con. g. 5s.	8,000,000	.....	.....	F. & A.	102½	.....
United Elec. Light & Power Co. (N. Y.).....	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—June 24 1901.						
American Bell Telephone.....4s.	.....	.....	1908	F. & A.	100½	101
Northwestern Telephone Co.....7s.	.....	.....	.....	.....	.....	.....
N. Y. & N. J. Telep. & Telg. Co. gen. mtg. 5s.	.....	.....	.....	.....	114	115
Chesapeake & Potomac Teleph. Co.....6s.	.....	.....	1911	J. & D.	108	106

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—June 24 1901.						
American Electric Heating.....7s	500,000	500,000	.....	.....	.....	.....
Armington & Sims Engine Co.....6s.	.....	.....	.....	.....	.....	.....
Barnes & Smith Car Co.....6s.	.....	.....	1908	J. & J.	106	107
Carborundum Mfg Co.....6s.	.....	.....	1904	J. & D.	.....	.....
Washington Pump Co.....6s.	75,000	.....	.....	.....	115	127
Valiant.....	.....	.....	.....	.....	.....	.....

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@17c.; Lake, 17@17½c.; casting, 16½@16¾c.

Business failures in the United States last week numbered 193, against 179 the same week last year; In Canada there were 14, against 25 last year.

Directors of the Amalgamated Copper Company on June 20, declared the regular quarterly dividend of 1½ per cent. on the stock, and ¼ per cent. extra.

A petition is being widely circulated on the floor of the New York Stock Exchange asking for extra holidays on July 5 and 6, as the 4th comes on Thursday.

The Metropolitan Street Railway Company has declared the regular quarterly dividend of 1½ per cent., payable July 15. Books close June 26 and reopen July 16.

The Electric Storage Battery Company has declared regular dividends of 1½ per cent., for the quarter ending June 30 on both common and preferred stocks, payable July 1 to stock of record June 26.

A Baltimore, Md., dispatch states that it is thought that negotiations are pending between the Consolidated Gas Company and the United Electric & Power Company, looking to a consolidation of joint ownership.

The Kensington Electric Light Company bill, which offered to supply the lighting of Philadelphia, in opposition to the Philadelphia Electric Company, has been killed by the Electrical Committee of Councils.

It is stated that the Everett-Moore syndicate is negotiating for the purchase of another large system of interurban trolley line, which, when added to their thousand miles of traction, will give them a line from Port Huron, Mich., to Pittsburg, Pa. Three States will be crossed.

The following are quotations for some of the industrial stocks not quoted elsewhere: Electrical Lead Reduction, 3¼@4; Electric Boat, 21@23; Electric Vehicle, 8@12; Tel. & Tel. Company of America (full paid), 5@6; Electric Company of America, 8¾@8½; National Carbon, 15¼@16.

Judge Brown of the United States Circuit Court in Boston handed down at 12 o'clock on Monday his written decision in the Berliner patent case, which decision was orally announced on February 27, and was decided against the American Bell Telephone Company. The written decision is quite elaborate, 113 pages embracing the full text of Judge Brown's findings.

Receivers were appointed Saturday for the Nashville (Tenn.) Street Railway, capitalized at \$13,000,000. The Baltimore Trust and Guarantee Company, holder of \$2,000,000 of the company's bonds, alleged that interest payment was defaulted. Federal Judge Clarke appointed E. F. C. Lewis and Percy Warner receivers, pending a sale by foreclosure.

The Boston Electric Light Company has declared a regular quarterly dividend of 2 per cent. and 1 per cent. extra, payable August 1. Transfer books close June 29, open July 10. This is the last dividend to be declared by the company as a distinct organization, as the company will be merged with the Edison Electric Illuminating Company before its next dividend period.

A large stockholder in the Chicago City Railway stated recently that the syndicate seeking to purchase the street railway lines of that city had thus far made no proposition to the controlling interests of that company. He conceded, however, that it had been intimated to him that a formal offer for the property would be among the advents of the coming autumn and that it would be on lines worthy of consideration.

There are good reasons to believe that Canadians have secured control of Twin City Rapid Transit lines and the new company will probably be friendly. A new company will build an electric line connecting Minneapolis with Anoka, about 25 miles. It is believed this line will be extended to St. Paul. On Twin City Rapid Transit traffic is often greater than accommodations, and the advent of a new line will be welcomed.

At a meeting in Boston of the directors of the New England Telephone and Telegraph Company on June 20, it was voted to issue \$2,577,000 new stock. Payments are to be made one-half August 16 and one-half November 16. This issue will give rights to one share of new stock at par for every six shares now held. Part of the new issue will pay for the construction already done during the first half of this year, and will provide for the needs of the company for the remainder of 1901, and a portion of next year.

At a meeting of the American Telephone and Telegraph Company in Boston on June 19, the resignation of the president pro tem., Alexander Cochrane, was accepted to take effect June 30 and Frederick P. Fish was elected president of both companies to take effect July 1. This is in line with the official announcement made some weeks ago. Application has been made to list the American Telephone and Telegraph \$15,000,000 4 per cent collateral trust bonds of 1929; and \$114,946,000 capital stock on New York Stock Exchange. The company has declared the regular quarterly dividend of 1½ per cent., and an extra dividend of ¾ per cent., payable July 15. Books close June 29 and reopen July 16.

President C. W. Wetmore, of the North American Company, in his report to stockholders, among other things says: "Important changes and readjustments have taken place in certain of the company's investments since the last annual report. On February 1 the company sold practically all of its holdings of the preferred capital stock of the Milwaukee Electric Railway and Light Company and now owns practically all of the common stock of that company. During the year the company has also purchased valuable electric and gas light properties in Covington, Newport, Dayton and Bellevue, Kentucky, and has limited the ownership of these companies into a new corporation called the Union Light, Heat and Power Company, a large majority of the capital stock of which the North American Company owns."

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EDITORIAL NOTES.

The Northwestern Electrical Association Convention.

The Northwestern Electrical Association Convention, which was held during last week at Sheboygan, Wis., was a most pleasant affair from both a technical and social standpoint. A number of interesting papers were read and discussed, but in order not to make Jack a dull boy by too much work recreations were provided, such as a baseball game between the Benedicts and Bachelors, a trap shooting contest and a dance, to say nothing of other entertainment features.

These summer meetings are certainly enjoyable affairs and afford many hard-worked electrical men an opportunity of discussing subjects of interest, at the same time enjoying a pleasant outing.

The proceedings of the Convention will be found on another page of this issue.

* * *

Braking Apparatus for Electric Cars

In view of the interest that has been and is being taken in this country in the subject of the braking of trolley cars a paper read a couple of weeks ago before the Municipal Electrical Association of England, at Glasgow, should prove extremely interesting. The author of the paper, Mr. A. L. C. Fell, classes the various methods of braking electric cars under six heads: (1) hand brakes; (2) friction brakes; (3) slipper brakes; (4) pneumatic brakes; (5) electro-magnetic brakes; (6) Newell electro-magnetic brake.

In regard to hand brakes he said that in his opinion there is not any particular advantage to be gained by using one particular type as compared with another. The chief point in connection with all brakes is that reliable men should be employed to fit them on to the wheels of the cars so as to insure even pressure on the wheels. One very important matter concerning the adjustment of brake rods is not to employ locking nuts, as they cause serious delay when this work is necessary. The adjusting nut should be kept in position by a pivoted claw which can be simply thrown back when it is necessary to move the nut. He has tested various types of brake shoes and finds the "Corning" brake shoe is the best.

Friction brakes it seems cannot be used on the majority of English electric roads because

of the amount of room required to properly mount them on the axle. Slipper brakes form the most useful type of brake at present operating in England. They simply consist of wood blocks which are pressed down on to the rails by means of levers which are operated by means of a hand wheel connected by a chain or worm gear at either end of the car. The operating hand wheel is fixed on to a tube spindle which is placed outside the solid hand brake spindle.

The two spindles are quite independent of one another and separate ratchets and pawls are provided for locking them independently. It has been found in practice that it is advisable to design the slipper brake operating hand wheel so that it is impossible to lift the car off the rails. The framework carrying the slipper brake shafting, levers and slides is fixed to the sides of the truck frames. On all gradients steeper than 1 in 20 it is advisable to use the slipper brake, and the best results have been obtained when the slipper brake is worked as an auxiliary to the hand or electric brake. On single lines with steep gradients the slipper brake is especially useful as it not only retards the descending car, but also cleans the rails for the ascending cars.

Pneumatic brakes, Mr. Fell remarked, are unsatisfactory on account of their not always being reliable. On the subject of electro-magnetic brakes he made observations as follows:

"One type of this brake consists of two cast-iron disks, one of which is fixed to the motor and has a coil of wire wrapped round it, the other is keyed to the axle. The motors are used as generators and gradually short circuited through a rheostat and the disk coil above mentioned. The disks are thus magnetized and braking action is produced from three causes: (1) Retardation due to converting motors into generators by driving them from the car axles on practically short circuit. (2) Drag due to eddy currents which are set up in brake disk as it revolves in the intense magnetic field of the brake shoe. (3) The mechanical friction between the brake disk and shoe.

"As the braking effect is so rapid, great care has to be exercised not to magnetize the disks too quickly, otherwise the wheels will at once be skidded unless a very plentiful supply of sand is used. On a good rail this type of brake can be used for taking a car down a gradient of 1 in 11, but it is always safer to use a slipper brake in conjunction with the electric brake. In practice it has been found advan-

tageous to bring the slipper brake into operation at the top of a gradient and fix it, the speed can then be regulated by the band or electric brake. In the writer's opinion the hand brake should never be used in conjunction with the electric brake. but, if the former is in use, it should be released before the electric brake is applied."

After briefly mentioning satisfactory experiments with the Newell brake, witnessed by him, Mr. Fell said that tests had been made to ascertain the best methods of stopping cars under various conditions. Cars were run over a marked-off space on a practically level road. The speed was in each case carefully noted, and the brakes were applied at the one point in each case. From tabulated results obtained by the author and from his previous experience, it appeared that for all-round general purposes, the hand brake worked in conjunction with the slipper brake is the best and most reliable method of regulating the speed of a car. This is especially the case if the rails are greasy, because the wood block thoroughly cleans the rail. For emergencies, the electro-magnetic disk brake is the most satisfactory, but it requires to be applied very carefully as it is very liable to cause skidding. Mr. Fell says that the constant use of electric brakes is not to be recommended for the following reasons: (1) They are expensive items, and the wear and tear is very excessive. (2) When the gradients are very steep the life of the motors will be appreciably shortened as they will never get an opportunity to cool down.

Judging from the above it might be well for some of the trolley companies in the United States to give the slipper brake a trial. It could probably be placed on a car as an auxiliary without in any way interfering with a hand brake or friction brake.

* * *

Electricity for Men-of-War.

Electrical apparatus is being adopted more and more by the various navies of the world. The battleships Alabama, Illinois and Wisconsin, recently built for the United States, are provided with the most up-to-date marine generating sets and electrical paraphernalia. In view of this constantly growing demand for electrical labor-saving devices on men-of-war, an article which recently appeared in the "Electrotechnische Zeitschrift" of Berlin, is extremely interesting. It appears from the article in question, that in the German service separate lead and return wires have been generally adopted, concentric cables being used in the neighborhood of the ships' compasses. Attempts to employ a ship's structure as a return have not proven successful, and so far as large vessels are concerned, this practice has been entirely superseded, but in the case of new torpedo boats, where economy in weight is a vital consideration, the practice, according to the writer of the article, still holds. In all places exposed to the danger of mechanical injury, such as the engine rooms and stock holds, lead-covered, iron-armored cables are employed, while elsewhere cables well insulated with rubber, but otherwise unprotected, except in some cases by thin rust-proof wire, are used. The wood casing formerly employed has been abolished, owing to its inflammability. Hitherto, the telegraph and telephone cables have been of the lead-covered, iron-armored type, but the

newest ships have been provided with a central subway, like a corridor, as well as side corridors below the armored deck, which may be used for the electric cables, telegraph and telephone wires, etc., thereby avoiding all danger of mechanical injury to the same. It is proposed to dispense with the steel armor in the future, even for the lighting and power cables, retaining only the lead protection.

The practice of soldering branch connections has also been discarded in favor of branch fuse-boxes, in which the connections are made with terminal bars. These branch circuit boxes are made for two, three, four, six and eight lamps. They are, of course, water-tight. Their introduction seems to have been a complete success, facilitating as they do systematic supervision of the ship's wiring.

Although slate is at present generally used for switchboard bases in the service, it is interesting to learn that iron is proposed as a substitute, owing to the unavoidable breakages which occur. Small machine boards with iron bases have already been successfully introduced, but the difficulty of insulating the terminals and connections has hitherto prevented the adoption of the plan on a large scale. With the exception of the connections with the measuring instruments, all the switchboard connections on the Furst Bismarck were for the first time made with bare copper bars, whereby a neat, solid construction is obtained, which is also accessible. The necessary protection against moisture is provided by enamel, which also serves to distinguish the poles, red and blue being used. This type of board is particularly advantageous where the available space is limited in depth, so it is claimed, since the connections behind require no supervision and the screw terminals may all be withdrawn from the front of the board.

UNDER THE SEARCHLIGHT.

Notes and Comments on Various Topics.

DR. HENRY PRITCHETT, president of the Massachusetts Institute of Technology, has been appointed superintendent of awards at the Pan-American Exposition and will have the selection of all the juries of awards.

A GERMAN firm has secured the contract for the electric lighting of Pekin.

HON. ROBERT H. FOERDERER, who may become head of the proposed new street railway company in Philadelphia, has pledged himself to secure three cent fares, provided that it can be demonstrated that dividends can be earned with fares at that low figure.

M. FOURNIER, the French chauffeur, who led in the Paris-Berlin automobile race from the start, dashed into Berlin at exactly 11:38 Saturday morning, covered with dust. He was the first to finish the long race. A big crowd and several bands awaited the arrival of the autos, and as Fournier pulled into the city the bands struck up "Le Marseillaise," while the crowd cheered long and lustily. Kaiser Wilhelm was not present at the arrival of the Frenchman, but he met the contesting automobilists later in the day at a banquet given in their honor.

THE "L'Eclairage Electrique," of Paris, is organizing a technical excursion to the United

States to visit the Pan-American Exhibition in Buffalo, and to attend at the same place the convention in August of the American Society of Electrical Engineers. The party will leave Paris August 3, arrive at New York August 11, and leave for Philadelphia the same day. August 13 will be spent in Washington, and the party will remain in New York from the 14th to the 18th. The programme from the 18th to the 26th coincides with that of the American Institute of Electrical Engineers. From Buffalo the party will go to Chicago, and from that city by way of the Lakes and St. Lawrence River to Montreal and Quebec, returning to New York September 3, and sailing from the latter city September 5.

CHARLES H. BAKER, president of the Snoqualmie Falls Power Company, recently stated that every wheel in Seattle and Tacoma, Wash., including the street cars in both cities, is turned by electric power from Snoqualmie Falls.

THE State Department has received from John N. Ruffin, the American Consul at Asuncion, Paraguay, a report showing that the trade of that country with the United States is increasing, and adding that the prospects are that before the expiration of the present year it will have reached an unprecedented volume. "For instance," the Consul explains, "the firm of Angulo y Cia, has devoted considerable space to an exhibition of United States goods, in which, I am informed, it is doing a large and ever-increasing business, especially in agricultural implements. It expects to make many sales of carriages, electrical supplies, bicycles, dry-paints, and other articles of United States manufacture."

THE prize of \$200 offered some time ago by the Association des Industriels of France for the best insulated glove for electricians was won by Mr. Franz Clouth, of Cologne. The prize-winning glove had an electrical resistance of 52,500 megohms and in a breakdown test it withstood a pressure of 11,000 volts for three minutes and 12,200 volts for one minute before being penetrated. The glove is of rubber lined with tricot.

A NEW form of portable surgical motor, which appears to have some good features about it, says the London "Electrical Engineer," is described in the current number of the "Lancet." The 16-volt accumulator is of the sealed type, having a capacity of 18 ampere-hours, and it weighs 34 pounds. The motor itself is of the type known as the "D" pattern on account of the shape of the field magnet. The armature is a Gramme ring, and is attached directly to the shaft which carries the cable, thus taking the part of a flywheel. It weighs about 15 pounds, and is mounted on a gunmetal turn-table, which enables it to rotate and follow the movements of the operator. The entire apparatus with cases included weighs about 70 pounds. For hospital work the motor is wound to suit the voltage of the main current.

ACCORDING to French official reports, which have reached the State Department through Consul General Guenther, the demand for electric ventilators in British India exceeds the supply. American manufacturers are handicapped by the fact that the people of British India prefer ventilators with blades from 4 to

6 inches long, while those of American make are only about 3 inches long. The establishment of a depot for automobiles in Bombay is also spoken of as of great promise for business.

THE Canadian Government has ordered Superintendent Keeley of the Dominion telegraph system to establish the Marconi wireless telegraph system along the Gulf of St. Lawrence. Equipment is on the way from New York and will be taken aboard the Government steamer Tyrian at Sydney. The first station will be installed at West Point, Anticosti Island. The system will be extended as rapidly as possible until all the principal points along the gulf are equipped.

THE system of parcel express service on cars of the Metropolitan Street Railway of this city was tried June 27, when four express cars were started over the route. The first left the main offices of the New York Electric Vehicle Company, 49th street and Eighth avenue, at 5:30 A. M. and went to Fordham. A second car left the offices at 8 o'clock. Two cars were also started from the Battery. Preparations are under way to establish terminals in White Plains, New Rochelle, Yonkers, and all the towns in the southern part of Westchester County. The cars used are the old mail cars formerly employed on the Third Avenue line.

At the recent convention of the Canadian Electrical Association held at Ottawa the city of Quebec was chosen as the next place of meeting. The claims of the ancient capital were championed by Mr. Geo. Holman, of the Canadian Electric Light Company. Mr. P. G. Gossler, of Montreal, was elected president. Mr. E. E. Cary, manager of the Packard Electric Company, of St. Catharines, first vice-president, was chosen for the higher position, but on account of pressure of business, he declined to accept. The newly-elected president occupied the position of second vice-president. He is superintendent of the Royal Electric Company of Montreal. He was unable to attend the convention. The other officers elected are: First vice-president, B. F. Ressor, manager of the Electric Light and Power Company, Lindsay; second vice-president, Edward Slade, manager Jacques Cartier Water Power Company, Quebec; secretary-treasurer, C. H. Mortimer, editor of the association's official organ, the "Electric News," Toronto.

REAR ADMIRAL BRADFORD, chief of the Bureau of Equipment, will point out in his annual report the necessity of equipping American men-of-war with a system of wireless telegraphy. As soon as the appropriation is obtained he will recommend the system to be adopted for the naval service. Believing that Commander Richardson Clover, naval attaché in London, is deeply occupied with his current work, the Rear Admiral has recommended to Secretary Long that a wireless telegraph expert be sent to England to represent the navy in the trials of the two new systems developed by Lloyd's agency.

ACCORDING to the "Electrician," London, an ingenious system has been employed by MM. Georges Claude and L. Bomtes de Villiers, engineers of the French Thomson-Houston Company, for the localization of earths on conduit systems of electric traction. An oscillatory current produced by the discharge of condensers is passed through the circuit formed

by the car-wheel, rail, fault, and plough working conductor, and passes through a hot-wire ammeter on the car. A condenser is also placed in this circuit to prevent the working current from passing through the ammeter if the test is made when the rails are live. So long as the car is distant from the fault the ammeter will only show a small deflection, as the apparent resistance of the rail and working conductor to high frequency currents is considerable. As the car approaches the fault, the apparent resistance decreases to a minimum and the deflection of the ammeter increases. The high frequency current is obtained by shunting the discharge knobs of the secondary of an induction coil through two condensers and a solenoid, and tapping off two points of the solenoid. The method may be made more sensitive by regulating the capacity of the condenser in series with the conductor and fault circuit, so that there is resonance between the capacity of this condenser and the self-induction of the connecting wires when the fault is below the car.

TO-DAY the owners of property along the line of the New York Central Railroad will join in an appeal to President W. H. Newman to change the motive power of the tunnel trains from steam to electricity. Realizing that a simple request might not be sufficient they formulated a business-like proposition to pay the New York Central at the rate of \$1,000 a block to make the change.

WITH a view to doing away with the smoke nuisance an exceedingly tall smoke stack, probably the second highest in the country, has just been completed at Constable Hook, N. J., for the Oxford Copper Works. The stack is 365 feet high and is built of brick, the chimney wall at the base being 7 feet thick. The inside diameter is 16 feet at the bottom and 10 feet at the top. This chimney was built by the Custodis Chimney Construction Company of Germany. The work was carried on from a scaffold inside the chimney.

THE National Bureau of Standards was opened in Washington on Monday, July 1. For the present the headquarters of the bureau will be in the building of the Coast and Geodetic Survey, but the law creating it carries an appropriation of \$250,000 for a new building, which will soon be planned. S. W. Stratton, formerly of the Chicago University, is director of the bureau at a salary of \$5,000. He will have as his assistants one physicist, one chemist, two assistant physicists, several laboratory assistants and a secretary. The bureau will exercise its functions for the Government of the United States, for any State or municipal government in the country, or for any society, corporation or individual engaged in pursuits which require the use of standards or standard measuring instruments.

A SPECIAL cable dispatch from Paris to the N. Y. "Herald" states that some interesting experiments were conducted on Monday at Le Vesinet with a new system of wireless telegraphy invented by Colonel Pilowski, an engineer officer in the Russian army, and M. Victor Popp, a well-known electrical engineer. There is nothing spectacular in the apparatus. It consists simply of two electrodes separated by a distance that varies according to the distance of the place with which it is desired to communicate. The negative is placed on a sheet of glass as isolator on the surface. The

positive is buried in the earth at a depth of from three and a half to four meters. These two electrodes are connected to the transmitting apparatus. The same arrangement is followed at the receiving station. This is all that is necessary for the dispatch and registration of messages, as was conclusively proved by M. Popp.

A BRAKE FOR ELECTRIC CARS.

A new electric track brake and heater for electric railway cars has been invented by Mr. F. C. Newell, and is being placed on the market by the Westinghouse Company.

The brake proper, which is suspended by means of powerful springs, comprises (1) a double-track shoe of peculiar construction, combined with a powerful electro magnet which when energized by current produced by the car motors acting as generators, is strongly attracted to the rail by magnetic force; (2) brake heads and shoes of the ordinary type, acting directly on the wheels and constituting a wheel brake of maximum power and efficiency; (3) sundry castings and forgings for simultaneously transmitting the downward pull and resultant drag of the magnetic track brake into lateral pressure upon the wheels.

The combination of these three elements in duplicate, together with the necessary tie-rods and attachments, constitutes a single-truck brake equipment designed for application to a four-wheel, or single-truck car; a double-truck equipment, being the equivalent of two single-truck equipments as above described, is required for an eight-wheel, or double-truck car.

In addition to the truck equipment, either single or double, as circumstances may require, a complete brake includes brake controller attachments for use when the motor controllers are not provided with braking points, and a diverter, or improved form of rheostat, for dissipating the heat generated by any excess of current over and above that required to operate the brake when the heaters are not in service.

When the brake is not in operation, suspension springs carry the track magnets and shoes entirely clear of the rails, and by means of their flexibility, permit the shoes to ride over or clear any obstruction not sufficient to cause the car to be stopped; when the brake is applied, through the saturation of the magnets with current supplied by the car motors acting as generators, the track shoes are strongly attracted to the rails, producing three distinct effects: 1. A noticeable increase in the pressure of the wheels on the track, because of the downward pull of the magnets. 2. A pronounced retardation by reason of the friction generated between the track shoes and rails. 3. A maximum braking effect on the wheels, obtained through the transmission of the resultant drag of the track shoes to the brake shoes by means of the mechanism provided for that purpose.

It is perfectly obvious, therefore, that the net result of these three effects combined represents a much higher braking power than can be obtained by the use of any other brake without skidding wheels; moreover, the feature of a powerful track brake, which, instead of decreasing the weight upon the rails at the wheels, actually increases it, is as unique as it is valuable: it is this feature that differentiates the Westinghouse electric brake from all other track brakes of known construction. The latter have not only failed to show any advantage over the ordinary wheel brakes, but

on the contrary, have proved distinctly inferior in the braking effect secured, because of their tendency to decrease the hold of the wheels upon the rails. No advantage in making quick stops is obtained, therefore, by the use of the ordinary track brake, because, if the principle underlying its operation be carried to the extreme limit, all weight upon the wheels would be removed and the vehicle would be borne by the track shoes in sliding contact with the rails—a practice which it is scarcely necessary to say has been fully demonstrated to be far less efficient than brakes acting against the wheels without sliding. It is highly important, therefore, not to lessen but rather to increase the pressure of the wheels upon the rails.

It should be noted that while the thrust against the wheel-brake shoes, caused by the drag or frictional resistance between the track shoe and the rail, is similar in its effect to the thrust obtained from the expansive force of compressed air acting upon the brake-cylinder piston in the well-known air brake, the magnetic brake has a decided advantage over the older type in this particular, viz., that the brake-shoe pressure is automatically regulated by the condition of the rail surface. This is a fortunate feature, which results in securing the highest possible braking power at all times without danger of wheel sliding. For example, if the rail be dry and sandy, the drag of the track shoes and the consequent thrust upon the levers applying the brakes to the wheels are great; if the rail be wet or greasy, the drag of the track shoes is lessened in inverse proportion to the frictional resistance between them and the rail, thus automatically decreasing the corresponding brake-shoe pressure on the wheels.

There is still another automatic adjustment of braking effect, scarcely less interesting, if somewhat less important. It is well known that, when the motion of the car is being rapidly retarded, the forward wheels carry a somewhat greater proportion of the weight resting upon the truck; from this it follows that by placing the fixed lowerfulcrum of the forward brake-shoe lever slightly above the pin connecting it with the telescope rod, a brake-shoe pressure is applied to the forward wheels proportionately greater than that acting upon the rear wheels; when the car is reversed, the governing conditions are also reversed and entirely satisfactory results attained—the levers and connections being so designed that, when properly adjusted, the highest possible braking power is secured, without reference to the direction in which the car moves.

As previously explained, the track magnets are energized by current, obtained from the car motors acting as generators, which not only obviates any expense in that connection, but also effectually prevents the possibility of accident through sudden failure of line current. The current necessary for the required magnetization is uniformly kept within safe limits by a proper adjustment of resistance always in circuit with the brakes, thus avoiding any injurious effect on the motors.

An additional advantage gained by the use of the magnetic brake is found by employing the improved form of rheostat, or diverter, previously mentioned (which has a constant resistance regardless of the heating produced by a continuous flow of current), in the automatic control of speed down long and steep

grades. This result is owing to the fact that a certain resistance in the rheostat insures a fixed current flow at a given speed; and this resistance can be readily adjusted so as to permit just enough current to pass through the track-shoe magnets to hold the car at the required speed, against the action of gravity, on any grade; any increase in speed increases the current and causes the brakes to act with greater force, while a decrease in speed instantly decreases the current and the brake action at the same time, so that the speed of a car may be automatically regulated within narrow limits regardless of changes in the gradient.

This brake can be readily applied to trail cars by properly attaching the track magnets and accessories to them and connecting the magnetic coils to the wiring system of the motor car.

Proceedings of the Northwestern Electrical Association Convention.

The Convention of the Northwestern Electrical Association, held at Lake View Beach Hotel, Sheboygan, Wis., was called to order on June 26 by President Debell.

The President stated that the meeting would be merely the formal opening of the session. Instead of extending any formal welcome to all of the members he wished they would take it for granted that they were all welcome and hoped they would have as good a time as possible.

On motion the reading of the minutes of the last session was dispensed with and they were approved as printed.

The Delavan Light & Fuel Company, Christensen Engineering Company, Pass & Seymour and Edwin Schuette were elected members of the Association.

The report of the special committee on Gasoline Lighting was then read to the Convention by the Secretary, the substance of which was as follows:

"It would seem from the reports received that each town has lost from a few to a large number of customers by reason of gasoline competition, but that most of these people have returned to the use of electricity, showing that while gasoline may be a very cheap light, there must be great drawbacks to its general use. There are in every town lots of people looking for something for nothing, and the gasoline idea is a smooth one and catches their fancy. They do not know the origin of the fluid, its quick evaporation on exposure to the air, and its consequent danger; and it is only by actual experiment that they become convinced that it is no good, and usually after paying \$150 or more for an outfit that cost about \$25. Of course it won't do to lose sight of this fact, that where many minds and much money is concentrated on one object that it is more than likely that some day a perfect gasoline lamp will be invented, and we must be on our guard and hold our customers by giving good service and good rates. But at present it is evident that it does not seriously threaten our interests."

After listening to several communications from absentees, regretting their inability to be present, the Convention adjourned to 2 P.M.

AFTERNOON SESSION.

The afternoon session was devoted to the

reading of two papers, namely, "Incandescent Lamp Economy," by Guy V. Williams, and "Trades Training by Non-Technically Educated Men," by B. V. Swenson, assistant professor of electrical engineering, University of Wisconsin.

The papers were not discussed and the Convention adjourned to Thursday.

SECOND DAY'S SESSION—THURSDAY JUNE 27.

President Debell called the Convention to order at 10 A. M.

The following communication was read by the Secretary:

Chicago, June 26, 1901.

To the Members of the Northwestern Electrical Association, Sheboygan, Wis.

Gentlemen: On behalf of the officers and directors of the Milwaukee Industrial Exposition Company I beg to extend to you collectively and severally an invitation to attend a grand electrical exposition to be given in Milwaukee Sept. 7 to 23, 1901. I wish to assure you that this will be no ordinary exhibit; it will be patronized by nearly all of the electrical supply houses manufacturing companies and electrical manufacturing companies. The property will be brilliantly illuminated and many features, new and novel, will be introduced, such as lectures on wireless telegraphy and high tension currents, under the auspices of Tesla. In fact, everything known to the science of electricity will be on exhibition.

Your Association is especially invited to attend and will be accorded every courtesy. Room will be provided you free of charge for committee meetings or convention purposes.

The time of year is perfect so far as climatic conditions are concerned; Milwaukee is, and always will be, unsurpassed for her hospitality to strangers, and the entire Northwest will be out to see this show.

Yours very truly,

CHAS. G. ARMSTRONG.

It was moved and carried unanimously that Prof. Dougal C. Jackson be declared an honorary member of the Association.

Mr. Budd Frankensfield then read to the Convention his paper on "The Efficiency Curve of a Shunt Motor and Its Relation to Operating Characteristics and the Cost of Operation."

The President—Gentlemen, you are all familiar with the programme for this afternoon, probably from seeing it in print. The trap shooting contest I think will be a very pleasant affair. I do not know how many members there are among those present who are experts in that line, but whether you are experts or not, if you can handle a gun in any way you will I think have a chance to enjoy yourselves. The members of the Gun Club here have voluntarily offered us the use of the grounds, and will furnish all of the necessary apparatus, and some of their members will be out in attendance this afternoon to get acquainted with us and have a little extra shoot on the side if any of you are so disposed. And the games to follow I think will also be found quite interesting. The theatrical entertainment this evening will be held in the summer theater adjoining the grounds here, and they say the play is a very laughable and funny piece, and I think you will all enjoy it.

The following applications for associate membership were then placed before the meeting, approved by the Membership Committee: Kurz & Root, Appleton, Wis.; Evans, Almirall & Co., Chicago.

On motion the Secretary cast the ballot of the Association for the above as associate members.

There being no further business before the meeting the Convention adjourned sine die.

ELECTRIC TRAMWAYS—INSULATED RETURNS.

(From our London Correspondent.)

There seems to be a prospect of the Board of Trade Electric Traction Regulations, which have given rise to considerable debate at different times, being reconsidered, in fact the Board is stated to be already in communication with certain authorities upon the matter. In view of this some interest attaches to a paper read before the Municipal Electrical Association Convention at Glasgow on June 19, by Mr. J. H. Rider, the chief electrical engineer in connection with the London County Council's tramway system, under the title "Uninsulated Returns in a Tramway System." He criticized the regulations relating to the earthing of the negative bus-bar, and advocated a reduction of the maximum differences of potential (now 7 volts). Regulations 5 and 6 he regarded as not only unnecessary, but undesirable. These related to connecting any part of an uninsulated return with the negative terminal of the generator and the manner of maintaining the earth connection in good order. Mr. Rider discussed his chief points as follows:

It will be observed that the current coming back from the rails, via the earth, to the negative bus-bar, must not exceed a certain value.

The strength of this earth current will depend entirely upon two things—(1) the difference of potential between the rails and the negative bus-bar; and (2) the resistance of the earth path. The former is the fall of pressure on the return feeder, which, although it may be only a small amount, from the point of view of economy in transmission, may be enough to send a large current back through the earth, particularly if the resistance of the earth path be low. This may readily happen on account of the existence of water or gas pipes near the return feeder, and particularly when a water pipe is used as the earth plate at the generating station.

In the case of the Plymouth electric tramways, where the shortest return feeder is 760 yards long, being connected to the rails at their nearest point to the generating station, the resistance between the rails and the earth-plate (water pipe) is only about 0.5 ohm. It was found that 25 per cent. of the return current come back through the earth.

Now the resistance of the earth path can be made practically infinite, by the simple expedient of removing the earth connection from the negative bus bar.

Regulation No. 6 (1) is apparently intended to protect gas and water pipes, by insuring that no current (or only a very small amount) shall come back through the earth to the generators. Regulation No. 5 practically invites such current, and provides means for its measurement. If the earth connection be removed from the negative bus-bar, no current can come back through the earth. Why then should the connection be made?

The Board of Trade Regulations appear to provide for an earth connection at the wrong place. When the return circuit of a tramway system consists partly of uninsulated rails and partly of insulated cables, the insulated part should be kept insulated except at the point where it joins the uninsulated part, and there the earth connection should be made rather than at the other end where it is joined to the negative bus-bar.

He added that with more than one return feeder, negative boosters might be necessary to keep the points of earth connection at the rails at about the same potential. Earth currents would then be practically non-existent. With only one return feeder no negative booster would be needed, unless it were desired to reduce the fall of pressure for economical reasons. In this case it would depend entirely upon the length of the return feeder as to whether it would be better to add to its cross-section, or to use a negative booster. In the majority of cases the latter would probably prove the better way.

It was hoped that as a result of the matter coming before the Convention, weight might be brought to bear upon the Board of Trade so as to obtain modifications somewhat in line with Mr. Rider's suggestions.

NOTES ON STREET LIGHTING.*

BY BAILIE W. MACLAY.

At the present time when the incandescent gas light is being so prominently forced upon the public notice, it may not be out of place to offer this paper upon street electric lighting.

One reads of statements being made by gas engineers and others interested in gas undertakings which might lead the innocent public to suppose that the days of electric lighting, at any rate for street purposes, are numbered. Perhaps, however, the public have by this time learned sufficient of the "gassy" nature of the statements which are apt to come from those who seem now at any rate to consider us serious competitors, not to place implicit trust in their statements.

Whatever else electricity may have accomplished, there can be no doubt that since its advent in 1880, there has been a steady and even rapid improvement in the standard demanded for street illumination. Until electric light was first introduced experimentally into the City of London, the public were contented with ordinary gas burners consuming 2 to 4 cubic feet per hour. Some of the lamps at important places contained groups of burners which showed evidence of an attempt to give a better standard of illumination. It may be taken that these gas lights gave an average of from 8 to 16 cp. each. When the contract for the experimental electric lighting of some of the main thoroughfares of the city of London, terminated, and the street lighting again reverted to gas, the amount of illumination which had sufficed in previous years was found to be absolutely unbearable in comparison with the electric light to which the public had now grown accustomed, and larger gas burners, and increased numbers of them, had to be fitted along all the routes which had been electrically lighted. Even this improvement, however, was not considered satisfactory, and in due time electric arc lighting was reinstated along the principal routes of the City of London. It is doubtless true, that at the time these operations were carried out the incandescent gas mantle had not reached its present stage of perfection, but until electricity had forced the pace there seemed to be no serious demand for a higher standard of illumination at all. To-day, however, the public perpetually cry for more light in their streets, and the statement has appeared in one

of our Glasgow evening newspapers, that if there is one thing over and above pure water and effective sanitation, which is absolutely necessary in a large city, it is efficient public lighting, and to offer bad lighting in order to save money is to waste both.

Even supposing electricity had done nothing more than prove the immense advantage of properly lighted streets, it must be admitted on all hands that in that point alone it has served an extremely useful purpose.

Although electricity has been content up to the present to smile good naturedly upon the labored enthusiasm which it sees its elder sister displaying with regard to the incandescent gas mantle, in her attempt to get somewhere near her younger rival in the matter of efficient street lighting, it may be well not to remain too long silent lest it be thought that in reality the end of the street electric lighting was already in view. Everyone will admit the enormous improvement which is made by substituting incandescent gas mantles for the ordinary flat plain burner, at any rate, while the mantles are new, and during the prevalence of calm, fair weather, and it is to be hoped that the extra expense, which will doubtless fall to be borne by the ratepayers, in regard to the renewal and up-keep of mantles and other accessories of the improved system, together with the extra time required to light lamps not fitted with by-passes as compared with the older arrangement, will be cheerfully borne without a murmur in consideration of the improved illumination. There is nothing, however, in all this to show that for main thoroughfares, where a really brilliant illumination is desired, incandescent gas can in any way equal, far less surpass, electric light. A great deal has been made of the argument that electric lighting is "patchy," giving a brilliant illumination within a certain radius from the lamp and a comparatively poor illumination at points midway between, and great efforts have been made to show that by converting the ordinary flat flame gas lamps into incandescent mantle lights, the illumination is much more evenly distributed although it may not be so intense at points near the lamps. This, however, has been investigated by electrical engineers and it has been found that an equal standard of lighting, measuring the light at points midway between the lamp columns, cannot be obtained in this manner, except by using such a number of incandescent gas mantles that the cost will be more than that of electric lighting to give the same result.

Apart from this, however, it is interesting to note that the gas people themselves are devoting their greatest energies to developing incandescent mantles, which they hope will give as large, concentrated and brilliant a light as can be obtained from the electric light. It would seem therefore that their anxiety in this direction goes entirely to disprove their own arguments.

On a recent occasion the question of lighting the Great Western Road, which may be styled the most fashionable promenade in Glasgow, was very prominently before the public, and was discussed very fully by the Town Council as well as by the sub-committee dealing with the matter. The question in this case was to some extent mixed up with that of lighting the tramway poles which had been fixed along the center of the road at distances of about 40 yds. apart. There was a very strong feeling amongst the public in favor of electric light-

* Paper read at the Municipal Electrical Association Convention, Glasgow, June 19, 1901.

ing, although incandescent gas lighting has been proceeded with along a considerable portion of the route and was showing a great improvement over the previous state of affairs. It was ultimately decided to do the lighting by means of electric lamps placed at a height of 27 feet from the road level to the center of the arc, each lamp being constructed to take 7 or 7½ amperes and to give about 700 cp. Counter proposals were made that gas mantles should be placed upon the tramway poles, but even supposing that the vibration of the poles did not have disastrous effects upon the mantles it was found impossible to produce an equal standard of illumination at any reasonable cost in this manner, except by introducing side lamps at intermediate points, and even then it was found that the cost for the same amount of illumination at the darkest points would be greater with gas than with electric light. In every case full benefit was given to the incandescent gas mantle, as it was credited with 50 cp. per mantle, this being a figure which doubtless may be obtained at the first start, but which public experience goes to prove is not maintained for very long. Of course no variations occur with electric arc lights due to the deterioration of the illuminants, and, provided the supply or current remains the same, the light is the same, year in, year out.

Probably a point which has to some extent escaped notice is the fact that lights placed high up give a much more pleasing effect than when fixed low down, even though the illumination may be uneven. It is possible that a very even illumination might be gained with a large number of closely spaced lamps of low candle power placed low down, but the effect would also be depressing in the same way that the lighting of a large hall is depressing unless the illumination extends to some extent upwards as well as downwards, or more correctly, unless the whole cubic contents of the hall are illuminated. In this way when walking along a large street or thoroughfare lighted with electric lamps at a considerable height, one feels a sense of airiness and magnitude which is missing if the lights are fixed low down.

It is not the object of this paper to discuss in any way the question of comparative costs, but it may be well to state that the 7 ampere lamps before referred to will be charged for at the rate of £12 per lamp per annum, every lamp burning the whole night through. This charge includes the maintenance of the lamps, supply of carbons, trimming, cleaning, and the supply of current, but the capital expenditure, except so far as the mains are concerned, is borne by the Police Department, and is not provided for in these charges. Gas has been taken at the present price of 2s. 6d. per 1,000 cubic feet, and what is known as the ordinary 50 cp. mantle has been allowed its fullest efficiency, which in the author's opinion is considerably more than it is entitled to. The prices which will prevail in Glasgow next year for 10 ampere arc lamps under similar conditions to the above will be £14 per lamp per annum.

So far it would seem that incandescent gas lighting in streets is not unlikely to have the same result as it has had in house lighting. It has been observed by those in a position to know that the ordinary consumer of electric light goes through three stages:—first, ordinary gas; second, incandescent gas, and third, electric light; and for this reason electricity supply authorities cannot but welcome the improvement over ordinary gas which the gas mantle

promises. No one who ever used incandescent gas is satisfied to go back to ordinary gas, and when thoroughly sick of incandescent gas the final plunge is taken into electric light, from which no one ever goes back. We may therefore take it that street lighting is now entering upon the second stage from which the only possible development must be an upward one, i. e., into electric light. In other words, the incandescent gas mantle is now acting in a similar manner towards electricity to that in which electricity itself acted towards gas in 1880.

THE SOCIAL ENGINEER—A NEW FACTOR IN INDUSTRIAL ENGINEERING.*

BY DR. W. H. TOLMAN.

In the changed industrial and economic conditions of to-day, the great concentration of capital and the massing of thousands of the employed, have brought about new problems. In the old times, master and man lived and worked together—there was a daily point of contact, a continuous personal touch. To-day all is changed. The employer, in many cases, is as much of an absentee as were the nobles in France in the latter part of the eighteenth century and the landlords of some of the worst tenements in slumdom. With the growing intelligence on the part of the workers, evidencing itself in a dissatisfaction with their social and economic surroundings, they are slowly learning how to crystallize their incoherent wants and their smothered discontents into definite propositions for an improvement of their conditions.

The personal touch between employer and employed has largely been lost, and it is not desirable, even if it were possible, to return to the earlier days. But for the successful conduct of the business of the twentieth century a point of contact must be sought for and established, though in a different way. This need has created a new profession, that of the "social engineer," a man who can tell the employer how he may establish a desired point of contact between himself, his immediate staff, and the rank and file of his industrial army.

On one occasion an employer of 5,000 men asked me what form of industrial betterment he could begin. This led to a few questions on my part. First, were the men allowed to drink beer on the premises, especially at the noon hour. "Oh, no!" was the answer, "we are very strict about that." Secondly, I inquired whether any rooms were provided in the factory where the men could eat their lunch, or any kind of shelter outside to protect them from the hot sun in the summer. I found that nothing was provided. In summer they were obliged to eat their luncheon in the shadow of the buildings; frequently their heads were shaded while their bodies were exposed to the hot sun. Under these conditions it was not surprising that the men went to saloons where they could have their beer and the privileges of the free lunch counter in comparatively cool and comfortable rooms.

To change these conditions I advised the fitting up of a room with plenty of windows and fresh air, and a temporary shelter in some part of the yard for summer use. I reinforced my suggestion by the instance of a certain factory where one large room is furnished

with tables and benches. A kitchen is provided where plain, substantial food is furnished at cost price. The men are divided into sections, and are given cards on which they write down their orders for the following day. One of their own number serves as waiter, going to the kitchen five minutes before the whistle blows to get the tray with the food which has already been placed there, corresponding to the written orders given on the cards. As soon as the men are seated at the tables the food, smoking hot, is placed before them, so that there is not a moment's loss of time. The average price of a meal is 15 cents.

After dinner they may adjourn to one end of the room, where are tables filled with reading matter, trade papers, technical journals, magazines—in fact, just the kind of reading matter that will appeal to the man at the bench who has a few minutes' leisure after eating. The men are also allowed to smoke for half an hour after they return to their work. The manufactured product is such as to permit this privilege in nearly all the rooms. There are very few factories where smoking could be allowed, but the fact that it is allowed here shows that the employer is willing to do all in his power for the comfort of his men. My visit to this factory happened on a Friday, when a religious talk of seven minutes is given to the men after luncheon. The speaker gave the men a straight-from-the-shoulder gospel talk on the Prodigal Son. I watched carefully to see how many would stay for the talk. With the exception of about twenty men, who were reading, the remainder, 180, stayed for the talk. When you consider that the men took their own time to listen to the religious talk, it is very significant. Since the establishment of this factory lunch-room three saloons in the neighborhood have gone out of business, and the fourth is having a hard time. In this particular factory the men appreciate the co-operation of their employer, and show it; however, in the majority of cases appreciation is not expressed, even if it be felt, but that fact does not lessen the obligation of doing one's duty. "Noblesse oblige" was never truer than to-day.

One of the first steps, in the writer's opinion, towards improving the condition of the employed is the provision of clean and comfortable rooms where men and women may eat their mid-day meal away from the noise, dirt, and routine of the work-bench or machine. The most far-sighted employers have been quick to see that taking care of their employes was good business, and have fitted up kitchens where a warm meal of plain, substantial food may be served at cost. The captains of industry are slowly learning a lesson from the captains of war, who lay great store on the physical equipment of their army, fully recognizing that the best-fed and the best-nourished soldier is the most efficient.

For the purpose of stimulating the employe to do his best, an increasing number of employers are offering cash awards for the best suggestions from their staff. In one large company a wagon driver called the proprietor's attention to the poorly paved streets about the freight stations, stating that he was never able to haul a full load of merchandise, to say nothing of the needless wear and tear on the horses and wagons. The attention of the city authorities was called to the poor paving, with the result that the streets are now in a proper condition. Thus the whole city gained by the

* From "Cassier's Magazine."

suggestion made by one driver to an employer who had drawn him out by the offer of an award for suggestions.

Closely allied to industrial betterment is social betterment, for every movement adding beauty, comfort, and satisfaction directly promotes a better communal feeling. In line with this thought, the engineering department of the New York Central Railroad has established a system of horticultural gardens and greenhouses, from which plants and shrubs may be prepared for use at the various stations, and trailing vines are supplied for the purpose of covering up the bareness of fences, poles, and buildings, adding beauty by the subtraction of ugliness. This form of social betterment is not confined to the New York Central Company. It can be extended still further, for there seems to be no reason why the employes of the road should not be supplied with the vines, plants, and shrubs for their own home adornment, at cost, and, under certain conditions, free, provided that they would agree to plant and care for a definite amount. By that means each employe becomes a "missionary of beauty," bringing the delight and pleasure of the flowers not only to his own home, but to the community.

In advising an employer what form of industrial betterment he will find the most important, I place a provision for a home, which, after all, is the true social center. In the workshop, the worker is under discipline; his course of action is thought out for him, and he thus becomes a part of the system, a cog in an intelligent machine, so to speak. In his home he is absolutely free; if the surroundings are such as to keep him in good health, to enable him to enjoy the charms of family life, he becomes a better man and a better citizen.

There is a direct relation between capital, labor and management, the three essential elements necessary to every enterprise. Consider how useless is capital without management to direct its resources, and, in turn, how both capital and management are dependent on the willing hands of labor to execute their will. Capital should conscientiously do all in its power to improve the condition of the workers, for a more vigorous man is able to do more work, a more intelligent man will do better work, and a more conscientious man will do more faithful work. On the other hand, labor should not view with cold suspicion the overtures of capital, but should meet them in a friendly spirit, with a mind open and ready to co-operate. Many employers have found that their efforts for industrial betterment have been met with surly looks, suspicion and indifference.

But it is not fair to expect the employer to do all. The capitalist should not be regarded as a thief and robber; labor should recognize the sincerity of his motives, and give him a chance to prove his sincerity by working with, and not against him.

The United States Leads With Patents.

It is interesting to note that, while there has been a falling off in the number of patents granted to citizens of Great Britain and also to citizens of Germany and France, the number of applications from the United States increased from 3,002 filed in 1899 to 3,189 in 1900.

VILLAGE EXCHANGES AND FARMERS' LINES.*

BY S. P. SHEERIN.

One of the many good fortunes of the farmer is to have constantly at hand some man (or men), from any or all the other vocations of life, ready and willing to tell him what he ought to do. I regret to say, however, that, notwithstanding the very excellent opportunities afforded him to follow the advice of other people, the farmer still persists in having a will and a way of his own. With all due respect to our farmer friends (and in my high regard for them I allow no man to go before me), I do not believe that they yet appreciate the great blessing the telephone has brought them.

The telephone—which after all, has only had its development in the last six or seven years—is a greater boon to farmers than to any other class of people. The great drawbacks of country life are its isolation, its meagre opportunities for social intercourse and its still fewer opportunities for protection.

When we add to these the disadvantages of being out of touch with the market and out of reach of the great news pulse of the country the sum of the country life's shortcomings is complete.

The telephone changes all this. It comes as a benefactor, exceeding all others in its possibilities and usefulness. No man can fully estimate its benefit to the farmer. It brings his ear close to the market tickers of the world; brings the weather report to his door in time to protect his crop and cattle, and travels, what would be to him and his horses, weary miles, in the ordinary transaction of his every-day business.

The telephone should be welcomed by the farmer—with open heart and ready hand—to the best of everything he has. I regret to say that this is not always done. Our farmer friends still insist, in a great many localities, upon being somewhat beggarly in their treatment of the telephone.

The telephone cannot (any more than any other agency) perform its proper functions except under fairly good conditions. It is entitled to the very best we can give. It is no longer an experiment; it has demonstrated its usefulness and its right to a fore-front position in the economies of life as completely as have the locomotive, the steamboat, the reaper and the threshing machine. It was extremely unfortunate in its birth, and its boyhood associations were not good; but it is fast approaching a glorious American manhood—"redeemed, regenerated and disenthralled."

Men do not now hesitate to put sufficient money into railroads; the steamboats on our lakes and rivers are perfect floating palaces, and the wise farmer pays a good price and gets a good article of reaper and threshing machine when he has reaping and threshing to do. It is, I am afraid, a slight reflection on the usual good sense of the average farmer who has progressed, in other respects, out of the cheap way of doing things, to find him insisting upon putting up cheap, grounded telephone lines, on native poles, 300 and 400 feet apart, marring the landscape and furnishing temptations to profanity by those who have to use them. A poorly constructed and badly managed country telephone line is many times worse than no telephone at all. There was a time when those

*Paper read at the meeting of the Independent Telephone Association, Buffalo, N. Y., June 12, 1901.

things served their purpose as educators, but that time has passed.

The large-letter primer (while a very excellent thing in its place) is not to be considered as a means of education by the chap who has reached the fifth reader, and is already fishing his jaw-breakers out of the Century Dictionary. We live in a progressive country. It is our duty to progress with our neighbors. We have no business to be clogs upon the wheels of progress. It is the duty of every fair-minded citizen to undertake to discharge, faithfully and well, his fair share of the obligations of citizenship. The farmer who fails to do this falls short of doing his full duty. The country telephone is fast becoming the most important feature of rural life. It should be treated with the respect and liberality which is its natural due.

The country telephone line (and all other telephone lines which go along the country road) should be considered as part and parcel of the road itself. They should not (in my judgment) be considered as tenants of the road, or as something that is there by sufferance, or by permission—grudgingly given—of those who, for the time, do not appreciate its advantages; but it should be regarded as a part of the road itself.

One of the primary functions of roads was that of facilitating messages between civilized peoples. The savages of the forest used their foot and bridle paths to transmit messages of peace or war, love or hate. Civilization early found its use for the messenger, and so well were his rights established that, I believe, it was laid down in the early common law that the pedestrian, bearing a message along the public highway, has rights superior to the horseman. The telephone is a messenger. More than that, it is a troop of messengers. It carries from home to home, from heart to heart, the messages of the people. It should be as highly regarded and as free from interruption on the highways of the country as the bearer of a writ of habeas corpus. There are no other means by which messages can be transmitted with so little wear and tear to the roadway.

I look forward to the time when telephone lines will be regarded as such sacred property that men and boys will no more think of interfering with a country telephone line than they do now of throwing stones at windows or killing song-birds as they pass along.

In order, however, to be entitled to this high regard of the public, the telephone must by its outward appearance, command the respect of the people. We are apt to say sometimes that "clothes do not make the man." I think this is true; but we cannot deny that outward appearances go a great way toward giving good or bad impressions of people and things.

Telephone lines should be substantially and neatly constructed. They should be of the very best material—good, heavy, well-shaped poles (no pole shorter than 25 feet nor smaller than six inches diameter at the top); cross-arms should be of regular length, and the wire put on in a thoroughly mechanical manner.

I have an impression that, as time goes on, and our high regard for the telephone increases, we may get along with shorter poles, and put our wires as near to the ground as electrical conditions will permit. My thought is that we will not have to use very high poles anywhere except at road crossings, and it is barely possible that we may reach a condition where

it will be found easier to go under cross-roads than over them.

Wherever it is possible, I think that not more than one line of poles should occupy the same side of the road. It will be entirely possible to build a line sufficiently strong and symmetrical to take on all the lines that should go along any particular roadway.

Of course, it goes without the saying that all lines should be iron or copper-metallic, and, as nearly as possible, the maintenance of the whole line should be under the control of one head, without reference to how many persons or companies may be interested in the pole line.

One of the great troubles of the country telephone line—as, indeed, it is one of the drawbacks we all have in cities—is the trees. In the cities we are able to escape this annoyance very largely by the use of cable; but of course it would be impossible to do this in the country. Not taking into account the great additional cost of that sort of construction, there are electrical considerations that make a continuously long cable line an impossibility. The trees on the country roads should give way to the telephone.

I am an advocate of trees, and believe that we should cultivate our forestry in every possible way consistent with the discharge of our other obligations. But as it was necessary to trim away the original forests to make the roads, so I would trim away the trees along the side of the roads which interfere with that part of the road belonging to the telephone. Trees along highways, near residences, can just as well be set back 25 or 30 feet. They have no business on the highway or overlapping the highway, when they interfere with the uses of the highway.

The telephone is the proper use of the highway. In many respects it is the most important use. Being a comparatively new thing, it may take legislatures and courts a little while to appreciate this, but just as surely as our American legislation and jurisprudence have found a way to clear all other obstacles from the path of material progress, so they will find a way to order the trees along the highways set back out of the way of the telephone. They will do this because the people will demand it—and the people, here, always get what they want.

Now as to the village exchanges: I believe they ought to be made just as numerous as the wants of the people may require; in fact, I think a number of small exchanges is infinitely preferable to a number of long, heavily laden party lines. There is not only utility in this, but a good deal of economy as well. The larger the number of people to be reached and the quicker we can reach those whom we desire to communicate with, the better our service will be.

In my judgment, village exchanges should be encouraged everywhere, and these village exchanges should have direct communication with the county seat exchanges and exchanges in the other towns of the county, and these latter exchanges in turn should be connected with the long distance exchanges of the several States. Our combination of lines and exchanges should be so complete that the farmer, sitting at his own hearthstone, can communicate by telephone with anyone, no matter where located, to whom he desires to speak.

The equipment of these country exchanges should be, in all respects, first class. I regret

that this is not always the case. It is often very poor, and I now wish to show some of the causes for this.

With all due respect to the manufacturers—and I think the manufacturers are entitled to a great deal of credit for the development of the telephone business—I cannot help the feeling that they are very largely responsible for a great lot of shoddy, inefficient and wholly abominable telephone equipment in the country. They go upon the theory that the farmer wants something cheap, and that the way to catch him is to present a very low-priced article, without very much reference to how long it will last or what service it may give him in the meantime. This is little short of criminal, and cannot be too strongly condemned.

This association, and all other people largely interested in the telephone business who want to escape responsibility for bad service by other people, as well as by themselves, should set their faces firmly against the manufacturers who make especially "Cheap John" equipment for farmers' lines.

The truth is that, for many reasons, the farmer ought to have better equipment than anybody else. It is very much more difficult for him to get repairs than it is for anyone else; in the very nature of things, he soon becomes very much more dependent upon his telephone than does the man living in the city, where distances between business associates and neighbors are very much less, and where other facilities for communication are very much more numerous.

Another explanation for bad equipment in the country is the very short-sighted practice indulged in by some city companies of selling their worn-out material to farmers at reduced prices. A chain is only as strong as its weakest link; the telephone or switchboard that is not fit for use in town is certainly not fit for use in the country. "Good equipment every where" should be the motto.

The battlefield of the great telephone war which has been raging in this country for the last five years, with the victories always on the same side, has been largely transferred from the cities to the country. The Bell companies, in the days of their monopoly—and, in fact, until quite recently—positively refused to furnish service to the farmer upon any terms. Now they have changed their minds about that, and seem to have concluded that the farmer and the villager are not such bad fellows after all. But their repentance has come too late. The farmer and the villager have been doing a thing or two for themselves, in the meantime. And this is part of what they have done in Indiana. I feel that you will pardon me for talking a little of my own State.

We have had a most desperate fight in Indiana for the last five years, notably for the last two years. We have been threatened by the opposition with everything from total annihilation to everlasting abode in eternal darkness. We were assured upon the honor of the very clever gentlemen who manage the Central Union Telephone Company that we would lose every dollar we put into the telephone business, with the further cheerful assurance that they knew what they were talking about, and would personally see to it that their prediction would come true. In furtherance of this last determination, they spent a good deal of their "war appropriation" in superhuman efforts to prevent our people from putting money into

the telephone business. It would be amusing, now, to read some of their statements. We learned long ago in Indiana that the immortal Lincoln was right when he said that, while one might fool part of the people all of the time, and all of the people part of the time, he could not fool all the people all the time.

When the first Independent telephone exchange was constructed in Indiana, the Central Union Telephone Company had been paying, for 12 years, on a capital of \$6,300,000 (three-fifths of which was pure water), annual dividends ranging from four to six per cent. It had no bonded indebtedness and no floating indebtedness that was reported.

When the fight with the Independents began it ceased paying dividends—the last one being paid in 1895. In 1897 it borrowed two and a half millions of dollars; in 1899 it borrowed six millions of dollars, two and a half of which was set aside to pay the holders of the first mortgage of two and a half millions. The company now has, in addition to this \$6,000,000 mortgage (according to recent publications), a floating indebtedness of \$1,250,000.

Now, let me tell you what all this has resulted in: The Central Union now has (as shown by its own figures) 22,000 telephones in the State. The real number is smaller than this, but we can afford to be generous, and I propose to give it all it claims. The Independent telephone interests have in the State of Indiana by actual count 52,469 telephones. I know you will excuse me if I repeat those figures. After a "war expenditure" of seven and a quarter million dollars—begun upon the Independent movement when there was less than 3,000 Independent telephones in the State—the Central Union now has, for its expenditure, 22,000 telephones, and the Independent movement has 52,469.

The total population of Indiana (according to the census of 1900) is 2,516,000. There are 92 counties in the State, and there are 27 of these in which neither the Central Union nor any other Bell Company has an exchange, large or small. The population of these 27 counties aggregates 491,000, and the aggregate number of Independent telephones in these 27 counties is 14,262. The total number of Central Union and other Bell Company telephones used at toll stations only in those 27 counties is 197.

I submit this Indiana statement more especially for the benefit of our friends in different parts of the country who are just beginning their fight with the great monopoly. If you ask me how they fought us, I can simply say—every way. If there is any mode of guerilla warfare that they left untried, we have not been able to find it. The Independent development in Indiana has been accomplished by Indiana self-helpfulness and Indiana capital. Of the millions invested in the Independent telephone business in Indiana, less than \$100,000 has come from outside of the State. More than that, the business is practically out of debt. The total indebtedness upon the Indiana Independent telephone property is less than 10 per cent. of its total value.

In this great success the farmers and villagers of the State have been of incalculable help. They realized (as all sensible men, similarly situated, must have realized) that their only hope was in becoming a part and parcel of the great Independent movement.

The Independent movement gives opportunity for self-helpfulness and intelligent co-

under the title "The Mechanism of Radiation," attempted to obtain answers to the two following questions: (1) What inferences can be drawn as to the mechanism by which radiation is emitted from an examination of the formula of physical optics? (2) Is it possible with the help of these inferences to frame any conception of matter which will give a consistent account of the various optical phenomena?

Mono-Rail Electric Line for London.

In connection with an elaborate project now working out for the better handling of its traffic at the central terminal stations in London, the South Eastern Railway Company has decided to set up a short length of Behr's electric mono-rail between the Cannon street and London Bridge Stations. The existing lines, which are worked by steam locomotives, will be preserved very much in their present condition, but the mono-rail track will be carried above them at such a height as will enable them to clear the tops of the carriages. Small high-level stations will handle a two minute service, the course being so arranged that a round and round continuous service will be possible without in any way interfering with the steam lines beneath. The expenditure is set down as about \$500,000. The better reception given to the mono-rail idea before Parliamentary Committees this year has doubtless had a good deal to do with this development. We may add that the Manchester-Liverpool project has passed the House of Lords and now merely awaits the decision of the House of Commons. It is hardly likely to meet with defeat there.

CANADIAN NOTES.

(From our Ottawa Correspondent.)

The Imperial Electric Light Company held its annual meeting at Montreal on June 25 and declared a dividend of 7 per cent. on its year's operations. Reports of the officers indicated a very prosperous condition. At the directors' meeting, subsequently, Mr. Victor Morin was elected president, Dr. Chagnon treasurer, and Mr. E. J. Chapeau managing director.

The offer of the Ontario Telephone Company to establish an independent telephone system in the city of Toronto, has been considered by a special committee of the city council, which has recommended that a contract be prepared to lay before the council. The offer is to install an up-to-date system, underground, in the center of the city and giving each subscriber a metallic circuit, the cost to be \$36 per annum for business phones, \$24 for house phones, and the two for \$50. The incorporators of the company are Henry H. Perkins, of Buffalo, N. Y.; Henry D. Kirkover, of Fredonia, N. Y.; Chas. B. Hill, Buffalo; S. E. Wayland, manager of the Wilkes-Barre and Scranton Independent Telephone Companies, and J. B. Ford, the promoter.

In respect to the electrical development by the Clergue Syndicate at Sault Ste Marie, Mr. Clergue says: "We do not contemplate erecting a steel plant on the American side. We are only developing power there. A canal is being dug which, when completed, will realize 50,000 horse power. Of this 20,000 hp. has been leased to the American Carbide Company of Chicago, and 15,000 hp. to the American Alkali Company, a firm which manufactures bleach-

ing powder and caustic soda. On the Canadian side we have developed 20,000 horse power and are developing 40,000 more, so we will shortly be producing 60,000 horse power, or 10,000 more than is being produced on the American side. Most of the capital to provide this development has been supplied by Philadelphians. The wealthy men of Philadelphia will not invest in anything but a good proposition."

Exports of Electrical Material from New York.

The following are the exports of electrical material, from the port of New York, for the week ended June 26:

Amsterdam, 1 box, \$15; Anam, 18 packages, \$1,030; Antwerp, 2 cases, \$200; Argentine Republic, 2 cases, \$158; Australia, 74 packages, \$17,708; Barcelona, 29 cases, \$7,000; Brazil, 75 packages, \$4,186; Bremen, 1 package, \$40; Bristol, 8 cases, \$4,000; British Possessions in Africa, 88 packages, \$3,778; British East Indies, 22 packages, \$3,153; British West Indies, 3 cases, \$51; Brussels, 8 packages, \$250; Central America, 72 packages, \$1,043; China, 3 cases, \$38; Christiania, 1 package, \$8; Cuba, 101 packages, \$3,399; Ecuador, 145 cases, \$3,133; Florence, 3 cases, \$50; Glasgow, 24 packages, \$3,830; Hamburg, 3 packages, \$340; 33 cases, \$4,778; Havre, 4 cases auto vehicles, \$2,880; 22 cases, \$1,672; Hayti, 31 packages, \$282; Helsingborg, 5 cases, \$90; Hong Kong, 1 case, \$50; Japan, 55 packages, \$8,277; Leicester, 2 cases, \$190; Liverpool, 40 packages, \$3,613; London, 266 packages, \$7,857; Manchester, 1 case, \$347; Mexico, 82 packages, \$1,294; Milan, 56 cases, \$1,698; New Foundland, 7 packages, \$355; 6 cases, \$178; New Zealand, 39 packages, \$3,686; Patras, 77 cases, \$7,831; Peru, 168 cases, \$9,727; Philippines, 43 packages, \$1,578; Santo Domingo, 554 cases, \$3,903; Siam, 263 packages, \$21,134; Southampton, 16 cases, \$2,000; Suez, 1 package, \$10; U. S. Colombia, 41 cases, \$385; Venezuela, 181 cases, \$1,080.

PERSONAL MENTION.

Mr. E. A. Leslie has been appointed general manager of the Edison Electric Light Company of Brooklyn, N. Y.

Mr. Garret Van Ginkel, late president of the Dallas, Tex., Consolidated Street Railway Company, was killed by one of the cars on the Exall Lake line June 19.

INCORPORATIONS.

The Electric Depot Company, Detroit, Mich. Capital stock, \$50,000. Shareholders: Claud B. King, John H. Fry, Joseph J. Bampton, William C. Hooper and R. W. F. Peters.

The Forster Electric Light Company, Chicago.—to deal in electric machinery and appliances. Capital stock, \$250,000. Incorporators: A. A. Rolf, J. E. Takken and P. J. Karstens.

The Henderson Electric Light & Planing Mill Company, Henderson, Tex. Incorporators: A. Wettmark, E. B. Felford and W. P. White.

The Prosser Electric Company, Prosser, Wash. Capital stock, \$3,000.

The Centralia Electric & Power Company, Centralia, Wash. Capital stock, \$100,000. Incorporators: T. Hass, H. Hass and T. Hass, Jr.

The Prevalent Prune.

Mr. George H. Daniels, of the New York Central road, has arranged to fill all the people full of prunes before they reach the Buffalo Exposition. Prunes are to be found on the menu of the dining car service in every shape and form, and the superintendent of chefs is now experimenting on a prune rarebit.—From the "Washington Post."

ELECTRICAL PATENT RECORD.

LETTERS PATENT ISSUED JUNE 25, 1901.

ELECTRIC RAILWAYS AND APPLIANCES.

676,888. Electric-Railway System. Emmerich Frischmuth, Berlin, Germany, assignor to the Siemens & Halske Electric Company of America, Chicago, Ill. Filed Feb. 12, 1900.

677,026. Electric Brake. Frank W. Garrett, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Oct. 24, 1900.

677,069. Car-Fender. Fred P. Dow, Fredericton, Canada. Filed Feb. 4, 1901.

677,145. Combined Brake and Power Controller. Emmett W. Stull, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Sept. 28, 1900.

677,262. Trolley. Alexander Palmros, Columbus, O., assignor to Joseph A. Jeffrey, same place. Original application filed Oct. 9, 1899. Divided and this application filed April 29, 1901.

ELECTRIC LIGHTS AND APPLIANCES.

676,952. Electric Lamp. Charles A. Hussey, New York City. Filed Oct. 29, 1900.

677,005. Feeding and Regulating Mechanism for Arc-Lamps. William E. Waldron, Colorado Springs, Col., assignor of one-half to Andrew J. Lawton, same place. Filed Feb. 6, 1901.

677,019. Electric Arc Lamp. Frank M. Conway, New York City, assignor to the Imperial Electric Lamp Company, same place. Filed July 18, 1898.

677,049. Electric Lamp Cluster-Fixture. Nelson Weeks, New York City. Filed Oct. 4, 1898.

677,298. Incandescent Lamp. Isidor Kitsee, Philadelphia, Pa. Filed March 2, 1900. Renewed April 23, 1901.

ELECTRICAL MACHINERY AND APPARATUS.

677,027. Operating Means for Electric Controllers. Frank W. Garrett, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Nov. 27, 1900.

677,038. Control of Electric Motors. Frank A. Merrick, Johnstown, Pa., assignor to the Lorain Steel Company of Pennsylvania. Filed Nov. 14, 1900.

677,071. Collector for Electric Generators and Motors. Arthur H. Eddy, Windsor, Conn. Filed March 27, 1901.

677,191. Electric Controller. Arthur C. Eastwood, Cleveland, O. Filed Feb. 6, 1901.

677,245. Apparatus for Making Secondary-Battery Plates. Albert F. Madden, Newark, N. J. Filed March 19, 1901.

677,269. Reversible Snap-Switch. Guy H. Proctor, Somerville, Mass. Filed Oct. 17, 1900.

677,308. Alternating-Current Motor. Carl Eickemeyer, Mary T. Eickemeyer and Rudolph Eickemeyer, Jr., Yorkers, N. Y., executors of Rudolph Eickemeyer, deceased, assignor to the General Electric Company, Schenectady, N. Y. Original application filed July 6, 1894. Divided and this application filed Jan. 24, 1901.

TELEPHONES AND TELEPHONE APPARATUS.

676,955. Telephone System. Frank A. Lundquist, Chicago, Ill., assignor to M. E. Richardson, trustee, Sterling, Kan. Filed Dec. 29, 1899.

676,956. Calling Device for Telephone-Exchanges. Frank A. Lundquist, Chicago, Ill., assignor to M. E. Richardson, trustee, Sterling, Kan. Filed Jan. 8, 1900.

MISCELLANEOUS.

676,949. Electric Heater. Gardiner C. Hawkins, Boston, Mass., assignor to the Bay State Electric Heat & Light Company, Jersey City, N. J. Filed Sept. 26, 1898.

676,950. Heating Apparatus. Gardiner C. Hawkins, Boston, Mass., assignor to the Bay State Electric Heat & Light Company, Jersey City, N. J. Filed Oct. 3, 1898.

676,965. Means for Recharging Storage Batteries of Electric Vehicles. Joseph Sachs, Hartford, Conn. Filed Oct. 5, 1900.

676,985. Electric Smelting-Furnace. Hugo Koller, Nuremberg, Germany. Filed May 17, 1900.

677,070. Electrical Heating-Furnace. Arthur H. Eddy, Windsor, Conn. Filed June 15, 1900.

677,156. System of Charging Storage Batteries. George H. Condit, New York City, assignor to the Electric Vehicle Company, same place. Filed Aug. 4, 1898.

677,169. Alarm Apparatus for Engine-Room Telegraphs or the Like. Thomas Bell, Liverpool, Eng. Filed Sept. 23, 1900.

677,226. Method of Producing Electrical Energy from Carbonaceous Materials. Hugo Jones, Chicago, Ill. Filed July 8, 1899.

677,244. Secondary Battery. Albert F. Madden, Newark, N. J. Filed March 19, 1901.

677,247. Electrically-Operated Plow. Conrad Meissner, Friedrichsberg, Germany. Filed Dec. 31, 1900.

REISSUE.

11,916. Electric Arc-Lamp. Edwin W. Rice, Jr., Schenectady, N. Y., assignor to the General Electric Company of New York. Filed May 1, 1901. Original No. 641,591, dated Jan. 23, 1900.

THE TELEPHONE WORLD.

Judge Brown's Decree Opens Telephone Field.

The decision by Judge Brown in the United States Court in Boston on June 27, in the case of the American Bell Telephone Company vs. the National Telephone Manufacturing Company and the Century Telephone Company, a proceeding involving the validity of the Berliner patent, has made operative hundreds of patents on transmitters and telephone improvements that were formerly held to be useless because they were infringements on the patent held by the Bell Telephone monopoly.

There are hundreds of claims for patents pending in the Patent Office at Washington, which have become valuable in the light of the Massachusetts court decision. Of course the Bell Company has appealed from Judge Brown's decision, but the holders of patents are sanguine that he will be sustained by the higher court.

Officials of the United States Patent Office declare that the field is now open for the organization of independent companies wherever sufficient capital can be raised to build a plant, for there is no longer a monopoly on the basic principle of a successful commercial telephone.

For the past twenty years the Bell people have controlled the main patents on the parts of a telephone necessary to construct anything more than a mere speaking tube.

The original Bell patent was only for limited use until the syndicate secured the exclusive right to the Berliner patent on an improved contact transmitter.

An official of the Patent Office in discussing this decision said:

"As the matter now stands the Bell people no longer have a monopoly on the Berliner transmitter, and the most important element in a commercial telephone is now open to free use.

"The decision of the court is in effect a rebuke to the Patent Office, for it was held that we had no right to issue the second patent, which amounted in effect to a re-issue of the original patent.

"There are any number of patents that have been issued on transmitters and other parts of telephones which will now possess considerable value, and which were formerly worthless because they were held to be infringements on the rights of the Bell Telephone Company.

"I presume that companies will be organized in various parts of the country for the purpose of giving independent service, and we may look for a big drop in the price of telephone service."

Lighthouse Telephones.

An innovation, which will be greatly appreciated by all mariners passing through the waters of Long Island Sound has been introduced at the Stratford Point lighthouse by the installation of telephonic connection.

The instrument was recently placed in position by the Southern New England Telephone Company in response to many requests from the owners of vessels engaged in the coasting trade, and it is expected that it will fill a long felt want.

A pay station has been established, thereby entailing no expense to the Government, and a sign to this effect has been placed in position near the light, so that it may be read by the masters of passing vessels with the aid of a glass.

It will now be possible for those desiring to obtain information from Captain Theodore Judson, the lighthouse keeper, regarding the passage of steamers, tows and other craft through the Sound. Such news is oftentimes required by the owners or those to whom cargoes are consigned, but has never in the past been accessible.

The steamboat companies in particular will find the new pay station a great convenience, for they will be enabled to obtain information as to their whereabouts, for Captain Judson has a broad sweep of the Sound from his home and can sight a vessel a long distance off either up or down the Sound.

A telephone line is in course of construction from Goochland, C. H., Va., via Maidens, to Shelton's Mills, in Louisa County, which, when completed, will give direct communication with Richmond by the Louisa line, and also over all the lines of the Louisa line and its connections. Charles and Robert Montiero are constructing the line.

The Bell Telephone Company, through Mr. West of Atlanta, Ga., has purchased the Elberton Telephone Exchange in that State for \$6,000, and will at once connect Elberton by long-distance phones with Atlanta and other cities.

The Delmarvia Telephone Company is making good headway with its line from Wilmington to Newark, Del.

The Nebraska Telephone Company is extending its line from Elmwood direct to Lincoln, making a short cut.

Independent Companies of Illinois Agree on Ten Years' Contract.

Independent telephone companies in Coles, McLean, Champaign, DeWitt, Logan, Macon, Moultrie, Shelby, Christian and Effingham Counties have entered into an agreement to exchange services over toll lines from June 1, 1901, to June 1, 1911. This agreement will prevent any of the companies from being absorbed during its life. Arrangements have been made to construct direct toll lines connecting Champaign, Bloomington, Lincoln, Farmer City, Leclatur, Sullivan, Mattoon and Taylorville, doing away with local toll lines connecting with the circuit from Mattoon to Terre Haute, which contributes to the long-distance line to Ohio, and connects at Effingham with the Kinloch system of St. Louis.

Telephones Here and Abroad

The independent companies furnish the only competition to the giant telephone concerns of the United States, while in Europe, wherever the telephone system is not under State or municipal control, municipal systems furnish the competition, which tends to cheapen the service. In Stockholm the service is supplied by the State, and the charge is \$14 a year. There is a telephone in that city for every twelve persons.

In Glasgow the Municipal Company is charging \$36 a year and the National \$50. The business of the Municipal Company is growing tremendously, and it is expected that public ownership of the telephone will soon be insisted upon by the British public.

The telephone system in Switzerland is under State control, and in the city of Zurich, which has a population of 150,000, there is one instrument for every thirty-five persons. There the charge is \$30 for the first year, \$14 for the second, and \$8 for the next and for each succeeding year, with an additional charge of a cent for each conversation.

According to a Bay City, Mich., paper, the Valley Telephone Company has purchased the Thumb telephone system, owned by F. W. Hubbard & Co., of Bad Axe and Port Austin. To connect this system with the Valley a line will be built from near Bay City to Sebawaing, at a cost of about \$25,000. The line will be metallic circuit. August 29 the contract with the Moore system in Tuscola County expires and the company will commence the construction of a system in that county. The company will at once begin the construction of another line to Bay City on the east side of the river. This will be the only line on the east side, all the others being on the west side.

There is talk of organizing a home telephone company at Logansport, Ind., to compete with the Central Union, which has announced a graded schedule of rates, at a substantial increase. The Central Union has solicitors at work seeking subscribers to the party line and "kitchen" service. Patrons say they will not pay the increased prices, but will order their telephones taken out. It is said that the New Telephone Company of Indianapolis was asked to come to the relief of Logansport, but it regarded the prevailing rates as too low.

The Central New York Telephone & Telegraph Company has established exchanges at Adams, Antwerp, Cape Vincent, Madrid and Theresa and is building exchanges at Clayton and Alexandria Bay, which are about completed. The construction of a new copper metallic circuit to Clayton and Frontenac Hotel, Round Island, is under way, as is also a metallic connection to Point Salubrious.

The farmers of Illinois have the telephone mania. Illinois husbandmen, it is asserted, believe in the telephone, because they can talk to their Chicago milk, butter, cheese and cream dealers over the wire every evening if they wish.

Letters patent have been issued for the incorporation of the Peninsular Telephone Company at Tampa, Fla., with a capital of \$300,000, to construct and operate a telephone system in Tampa and forty-one other towns in Florida, and to establish and maintain ten long-distance telephone systems. W. G. Brarlen, James J. Langford, James W. Barwick, Jacob F. Brarlen and Guy Huffman are named as incorporators.

Whitesburg, Ky., citizens have agreed to subscribe generously for the building of a telephone line from Stonega, Va., 16 miles distance. Work will be commenced at once and pushed to completion.

A report from Charlestown, Ind., states that the telephone service has been seriously impaired by the severe storms.

The Murdock, Minn., council has granted the Murdock-Carlson Telephone Company the privilege of erecting poles.

Modern Telephone System for New Brunswick.

P. Mooney was recently awarded the contract for building the New Brunswick Telephone Company's new exchange at St. John. It is a big work, the estimated cost being \$100,000. It is expected it will be ready for use early next year. The most modern telephone system will be installed.

After much work by the workmen of the New England Telephone & Telegraph Company on the private telephone line of division 3 of the Worcester, Mass., Consolidated Street Railway, the line is in working order, and there is a good circuit between Clinton and Leominster. The line between Clinton and Worcester, which was in use on the old Worcester & Clinton line, is still doing business, but there is a change coming, for the little red call boxes which are put in with the new line are placed in position along the line, and all there is to do is to connect them to the wires which were in use on the old circuit.

The United Telephone & Telegraph Company, incorporated by A. T. Averill, W. H. Dunn and G. M. Averill of Cedar Rapids, Ia., and Charles Webster and G. W. Patler of Waucoma, Ia., has filed its articles in Hennepin County, Minn. The capital stock is \$100,000. It is understood the new company will take over the property and franchise of the Greene & Western Company, and co-operate with the Twin City Telephone Company. The Greene & Western lines run from St. Paul to Mankato and from Minneapolis to Waterville.

The Inter State Telephone Company, the purchaser of the Home Telephone Company of Trenton, N. J., is now considering the improvements needed to put the local plant in first-class condition. The following is the new board of directors in charge of the local plant: C. W. Kline, of Hazleton, Pa.; Congressman H. C. Lonsdale, of Camden, N. J.; A. M. Worstell, of Philadelphia; Hugh H. Hamill, Barker Gummere, Jr., R. P. Wilson, L. B. Risdon, George McPherson and Albert Clayton.

At a recent meeting of the board of directors of the Syracuse, N. Y., Telephone Company, it was decided to extend the company's long distance lines to Oswego, a new line to be constructed along the shore of the lake from Lakeside Park to Long Branch and Liverpool to connect with the line running to Baldwinsville and Fulton. A new line will be strung from Fulton to Oswego.

A recent report from London, Ont., states that the Bell Telephone Company is working on the installation there of the central energy system. The work may be completed this year, and will be a great convenience to patrons. There will be no bell ringing. All the batteries will be at the central station.

The formation of a telephone company, with a capital stock of several million dollars, is about perfected in West Virginia. The Fairmont & Mannington Telephone Company's lines have been gone over by inspectors employed by the combination, and also other local lines throughout the State have likewise been inspected.

The Nebraska Telephone Company is spending \$5,000 in improving its local plant at West Point. Wires are being strung in metal tubes instead of singly, a new and improved switchboard is being put in and other improvements are under way.

Telephone Companies Increase Stock.

The Citizens' Telephone Company, Washington C. H., O., from \$50,000 to \$100,000. The Ft. Dodge Telephone Company, Ft. Dodge, Ia., from \$25,000 to \$50,000.

TELEPHONE INCORPORATIONS.

The Gibson Telephone Company, Gibson City, Ill. Capital stock, \$12,000. Incorporators, G. F. Schlosser, A. L. Phillips and H. A. Ball.

The Richfield Springs Telephone Company, Richfield Springs, N. Y. Capital stock, \$5,000. Directors: M. A. McKee, John Gyer and F. E. Munger, all of Richfield Springs.

The Farmers' Mutual Progressive Telephone Exchange, Houston, Ill. Capital stock, \$190. Incorporators: A. M. Redpath, Thomas Brown and W. R. Preston.

The International Wireless Telephone & Telegraph Company, Phoenix, Ariz. Capital stock, \$25,000,000. The papers are from Philadelphia and are signed by W. Gehring, H. W. Shoemaker, R. Leander, W. J. Moss and Henry W. Dash.

GENERAL ELECTRICAL NEWS.

Lighting.

Arcadia, Fla.—J. J. Heard, C. C. Chollar and J. L. Jones have incorporated the Arcadia Electric Light, Ice & Telephone Company with \$20,000 capital stock for the construction of an electric light plant, etc.

Asheville, N. C.—The Asheville Electric Company has asked for a lighting franchise for Asheville and Weaverville.

Beaumont, Tex.—The Beaumont Street Railway Company has purchased a site for the power house and electric light plant, and will soon begin the work of construction.

Burlington, Ia.—The mayor has signed the resolution calling for bids for public lighting which are to be received by August 1.

East Greenville, Pa.—The citizens of this place are agitating the question of erecting an electric light plant.

East Palestine, O.—East Palestine is figuring on enlarging its electric lighting system.

Evansville, Wis.—The citizens are agitating the question of erecting a municipal electric light plant.

Lisbon, N. D.—The citizens are agitating the question of erecting an electric light plant.

Little Falls, N. Y.—Last week fire destroyed the electric plant of I. N. Lovenheim.

Minot, N. D.—L. M. Davis contemplates the erection of an electric light plant in this place.

New Martinsville, W. Va.—The Ohio Valley Development Company, of which H. Thomson is president, was recently incorporated and will apply for a franchise for the erection of an electric light plant.

North Branch, Mich.—An electric light plant will soon be established in this village.

Norway, Mich.—The citizens have voted to issue \$25,000 in bonds to build an electric light plant.

Oneida, Ill.—W. D. Patty, H. W. Crane, S. J. Metcalf, and F. Stephen have been granted a franchise to build an electric light plant in this place.

Parsons, Kan.—The Parsons electric light plant was almost destroyed by a recent fire. The loss is about \$1,000.

Pedricktown, N. J.—This place is to be lighted by electricity.

Port Leyden, N. Y.—This place may have electric lights in the near future.

Salem, Ore.—The Salem Light, Power & Traction Company has been incorporated for \$130,000 by W. A. MacRae, D. H. Page and R. Mallory. The company will build and operate an electric light plant and street railway in this city.

Soda Springs, Idaho.—D. Swinehart of Pocatello has a proposition for putting in an electric light plant here.

South Seattle, Wash.—It is proposed to install a system of electric lighting in this place.

Stewartville, Minn.—The citizens of this place are agitating the question of erecting an electric light plant.

Sulphur Springs, Tex.—The electric light plant was recently damaged by lightning.

Texarkana, Tex.—The Kansas City, Mo., concern, headed by R. M. Shaw, has been granted a franchise for the erection of an electric light plant here.

Thompson, Mont.—A proposition is on foot to give this town an electric light plant. J. Pruden of Missoula is interested.

Warsaw, Ill.—E. H. Hillman, owner of the electric light plant here, contemplates the erection of a new plant in the fall.

Washington, Ia.—The citizens of this place will soon vote on the question of erecting a municipal electric light plant.

Waukegan, Ill.—Chicago men, represented by W. S. Lester, are negotiating for the purchase of the electric light plant.

Waverly, Tenn.—A. E. Justice and J. P. Cowan have incorporated a company for the establishment of an electric light plant. Address A. E. Justice.

Woodstock, Va.—The Woodstock Electric Light Company has been organized with Charles S. York, of Baltimore, president.

Street Railways.

Canastota, N. Y.—The Canastota & Morrisville Railway Company has been organized with \$300,000 capital stock to operate a street surface electric road from here to Morrisville.

Celina, O.—Celina is soon to have an electric railway. Messrs. Carpenter and Callister, of the Western Ohio Railway Company, have met the council and secured a franchise to construct and operate an electric line in this city. They promise the cars will be in operation by November 1.

Chihuahua, Mex.—Governor Ahumada has granted an extension of one year to General Mills and associates in which to convert the street car lines in Juarez to an electric system.

Cincinnati, O.—The board of public service has approved the ordinance authorizing the Cincinnati & Northwestern Railway Company to change its motive power from steam to electricity.

Clyde, O.—The council has granted a franchise to the Sandusky, Clyde & Tiffin electric railway projectors.

Columbus, O.—A company was incorporated lately to build another interurban railroad into this city. The name taken by the organization is the Ohio Central Railway Company of Columbus, though because of the similarity of that name to the name of a well known Ohio steam road, it may be necessary in the opinion of the Secretary of State to take another name. The company proposes to build and operate an electric railway from Columbus to Bridgeport, Belmont County. Senator W. E. Finck is one of the promoters.

Dixon, Ill.—The Northern Illinois Electric Railway Company has been organized in this city with headquarters at Steward. The organizers are Titus Brothers of Steward, and S. D. Frost of Amboy. The right of way has been secured from Steward to Amboy, and from Lee Center to within a mile of Dixon.

Doylestown, Pa.—A new trolley company has been formed with Recorder B. Michener as president and W. C. Ryan and C. S. Baldeston as secretary and treasurer to construct a road from here to New Hope by way of Mechanicsville and the Cuttlossa Valley.

Galesburg, Ill.—A franchise has been granted the People's Traction Company to build an electric road from this city to Abingdon, a distance of 12 miles.

Georgetown, Ky.—The fiscal court has granted to G. Alexander, A. S. Rice, W. Adams and others a franchise to construct and operate an electric railway between here and Lexington.

Hazleton, Pa.—Surveys for a trolley line, which is to connect this city with Wilkes-Barre, have been completed, and the contract for the construction of the road, which will be 26 miles long, will be given out shortly. A tunnel 2,700 feet long, will be run through the Wilkes-Barre Mountain. Alvin Markle is one of the capitalists interested in the enterprise.

Milwaukee, Wis.—Manager J. I. Beggs of the Milwaukee Electric Railway & Light Company states that an electric line to Hale's Corners will be constructed at an early date.

Monaca, Pa.—The borough council of this place has granted right of way over certain streets to the Corapolis and Monaca Electric Street Car Company. When this line is completed, Beaver Valley will have street car connection with Pittsburg.

Nashville, Tenn.—The People's Street Railway Company has asked for a franchise to build an electric line on certain streets of this city and suburbs.

Newton, N. H.—The selectmen gave a hearing a short time ago on the application of the Haverhill, Plaistow & Newton Street Railway for a location of its tracks in this town. The location was granted subject to such conditions as the selectmen think the interest of the town demands. This will be the first trolley line to run through this town.

Oil City, Pa.—Local capitalists composing the Citizens' Traction Company have completed arrangements to build a trolley line from here to Franklin, a distance of eight miles along the Deep Hollow.

Port Clinton, O.—The Lake Erie, Bowling Green & Napoleon Railway Company was lately incorporated

with \$300,000 capital stock. It will build an electric railway from here to Defiance.

Reading, Pa.—The Reading Electric Railway Company has filed articles of incorporation with an authorized capital of \$50,000.

Spokane, Wash.—The Northwestern Mammoth Granite & Electric Power Company has been incorporated for \$100,000 for the purpose of building an electric line from this city to Little Spokane. J. R. Price is interested.

Troy, N. Y.—James F. Brearton is obtaining consents for the electric railway which it is proposed to build along the river front in this city from Adams street to the State dam. This railway will be for carrying freight.

Watertown, N. Y.—The International Electric Light & Power Company of Jefferson County has voted to increase its capital stock to \$250,000, and it is understood will build a trolley line from Redwood on the Rome, Watertown & Ogdensburg Railroad to Alexandria Bay on the St. Lawrence River, a distance of eight miles.

Manufacturing.

Des Moines, Ia.—Dodd & Struthers, manufacturers of X-ray machines and electrical apparatus of various kinds, have bought a 66-foot lot, and will erect a brick factory at once.

Glen Ridge, N. J.—A deed has been filed at Newark, N. J., for the sale of the Hayden estate on Bloomfield avenue in this place to Thomas A. Edison. The land is part of a plot on which is to be erected the factory for the manufacture of Edison's recently invented storage battery.

Company Matters.

Morton, Pa.—A new firm known as the Worrell Electrical Company has opened offices here. The members of the firm are D. V. Worrell, W. C. Timm, Jr., and L. P. Edwards.

Waterloo, Ia.—The Waterloo Gas & Electric Company has increased its capital stock from \$180,000 to \$220,000.

Power and Transmission.

Allegan, Mich.—W. H. Patterson of Grand Rapids will erect a dam across the Kalamazoo River at this place, and build a large electric power plant to be used by the Grand Rapids, Allegan & Kalamazoo Street Railway.

Dover, Del.—The United Railway, Light & Power Company, with a capitalization of \$5,000,000, was incorporated here lately. The company is authorized to purchase and acquire land and buildings for operating railways and heat, light and power plants.

Mines.

Park Valley, Utah.—The mines and mills of this place are to be provided with electrical energy. The Golden Electrical Power & Transmission Company has been organized with a capital of \$50,000 by business men of Salt Lake City, with a view to supplying the power and light used in the camp. The company will harness the waters of George Creek at a point about four miles from Park Valley, and expects to be able to turn on the electric current within the next six months. Contracts for furnishing power have already been made with the Century, the Planetary, El Amigo, West Century and Golconda Mining Companies.

Automobiles.

Birmingham, Ala.—The Birmingham Electric & Manufacturing Company, a corporation recently organized by J. M. Lansden and William M. Little for the manufacture of electric elevators and automobiles, has bought a lot and expects to begin building at an early date.

Winston, N. C.—An automobile or street car line will probably be established between Winston-Salem and Greensboro.

ELECTRICAL SECURITIES.

The subjoined quotations of Electrical Securities dealt in at the leading commercial centers are compiled from special reports received by **ELECTRICITY** from a variety of sources. The utmost care is exercised in their collection and preparation, and every effort is made to secure accurate and reliable information. The management of this journal will esteem it a favor to have brought to their attention any inaccuracies readers may discover in these columns.

Abbreviations: crt. indb., certificate of indebtedness; coll., collateral; cons., consolidated; const., construction; conv., convertible; com., common; deb., debentures; exten., extension; gen., general; g., gold; guar., guaranteed; inc., income; imp., improvement; pd., paid; pfd., preferred; mig., mortgage; tr., trust; A., annually; S., semi-annually; Q., quarterly; A. & O., Apr. and Oct.; F. & A., Feb. and Aug.; M. & S., May and Sept.; J. & D., July and Dec.; J. & J., Jan. and June.

STOCKS.

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Authoriz'd	Issued.				
Albany, N. Y.—July 1					
United Traction Co. (Consolidation of the Albany and Troy City Railway.)	100	\$5,000,000	\$5,000,000	1% Q.	106 108
Allentown Pa.—July 1					
Allentown & Lehigh Val. Trac Co	100	4,000,000	1,500,000		15
Bridgeport, Conn.—July 1:					
Bridgeport Traction Co	100	2,000,000	2,000,000	1% Aug.	100
Baltimore Md.—July 1					
a United Railways & Elec. Co. com.	50	24,000,000	18,000,000		17 17 1/2
Boston, Mass.—July 1					
New England Street Ry.	25	5,000,000	1,081,925	1% Q., Jan. 15,	106 108
North Shore Traction Co. com.	100	4,000,000	4,000,000		16
North Shore Traction Co. pfd.	100	2,000,000	2,000,000	5% S. A. & O.	85 87
b West End Street Ry. Co. com.	50	10,000,000	8,000,000	3% S. Oct.,	95 95 1/2
West End Street Ry. Co. 8% pfd.	50	6,400,000	6,400,000	4% S. Jan.	114 115
Boston Elevated R. R.	100	10,000,000		2% Aug. 99,	179 181
Brooklyn N. Y.—July 1:					
Brooklyn City Ry.	100	2,000,000	1,928,400		245 250
Brooklyn Rap. Transit Co., tr. cert.	100	48,000,000	48,000,000		81 1/2 82
c Brooklyn Heights Railroad.	100	200,000	200,000		107 109
d Brooklyn City RR. guar.	100	12,000,000	12,000,000	8% Q., Jan.,	267 289
e Brooklyn, Queens Co. & Sub. RR.	100	2,000,000	2,000,000		325 330
Coney Island & Brooklyn RR.	100	2,000,000	1,884,200	2% Nov.,	
Kings County Elevated.	100	4,750,000	4,750,000		
Kings County Traction Co.	100	4,500,000	4,500,000	1% July	
Nassau Electric Railroad. pfd.	100	6,000,000	6,000,000		82 83
f Atlantic Avenue Railroad.	50	2,000,000	2,000,000		
g Brooklyn, B. & W. E. Railroad.	100	1,000,000	1,000,000		
Buffalo N. Y.—July 1:					
Buffalo & Niagara Falls Elec. Ry.	100	1,250,000	1,250,000		74 75
* Buffalo Railway Co.	100	6,000,000	5,870,500	1% Q. Dec.	99 100
Columbus O.—July 1					
Columbus Street Railroad.	100	8,000,000	8,000,000	1% Q., Feb.	38 39
Columbus Street Railroad, pfd.	100	1,500,000	1,500,000		100 102
Charleston, S. C.—July 1					
Charleston City Ry. Co.	50	100,000	100,000	3% S.	
Enterprise City RR. Co.	25	1,000,000	250,000		
Chicago, Ill.—July 1					
Chicago City Ry. Co.	100	12,000,000	12,000,000	3% Q., Dec. 31,	250 260
Chicago & South Side R. T. RR.	100	10,828,800	10,828,800		18 1/2 19
Lake Street Elevated RR.	100	10,000,000	10,000,000		34 1/2 35
Metropolitan West Side Elev. Ry.	100	15,000,000	7,000,000	Feb 28 1900.	82 92 1/2
Met. West Side El., pfd.	107	15,000,000	9,000,000		209 210
North Chicago Street RR.	100	10,000,000	6,600,000	3% Q., Jan.	200 201
n North Chicago City RR.	100	500,000	249,900		108 109
South Chicago City Railway.	100	2,000,000	1,608,200		103 103 1/2
West Chicago St. RR. Co.	100	20,000,000	18,189,000	1% Q., Feb.	18 1/2 18 3/4
Union Traction Ry. com.	100	1,250,000	624,900	3% S.	59 59 1/2
Union Traction Co. pref.	100	2,000,000	2,000,000	5% S.	
Cincinnati, Ohio.—July 1:					
Cincinnati Inc. Plane Ry. com.	50	1,000,000	575,000	1% Feb.	
Cincinnati Inc. Plane Ry. pfd.	50	150,000	150,000	1% Feb.	
Cincinnati, Newport & Oov. St. Ry.	100	8,000,000	8,500,000	1% Q., Jan.	124 125
Cincinnati Street Ry. Co.	50	18,000,000	14,000,000	1% Q., Jan.	126 127
Mt. Adams & Eden Park Inc. Ry	50	2,500,000	2,200,000		
Cleveland, Ohio.—July 1:					
Akron, Bed. & Cleve. Elec. Ry.	100	1,000,000	1,000,000	1% Jan.	48 50
Cleveland City Ry.	100	8,000,000	7,600,000	1% Jan.	100 102
Cleveland Electric Ry.	100	12,000,000	12,000,000	3% Q., Oct.	80 81
Detroit, Mich.—July 1:					
Detroit Citizens' Street Ry.	100	2,000,000	1,250,000		100 101
Ft. Wayne & Belle Isle Ry.	100	1,000,000	1,200,000		175 176
Rapid Railway Co.	100	250,000	250,000		90 100
Detroit Electric Railway	100	1,000,000	1,000,000		100 110
Wyandotte & Detroit River Ry.	100	250,000	200,000		
Dayton O.—July 1:					
City Railway Co.	100	1,500,000	1,470,600	1% Q.	140 145
City Railway Co. pfd.	100	600,000	600,000	1% Q.	170 171
People's Street Railway.	100	1,100,000	1,100,000		114 115

PASSENGER RAILWAYS.

NAME.	Par	Capital Stock.	Rate and Date of Last Div.	Bid.	Asked.
Authoriz'd	Issued.				
Hartford Conn.—July 1					
Hartford Street Ry. Co.	100	\$4,000,000	\$300,000	3% S. Oct.,	150
Hartford & West Hartford	100	1,000,000	247,000		
Holyoke Mass.—July 1					
Holyoke Street Ry. Co.	100	400,000	400,000	3% A. June,	207 1/2 212
Hoboken N. J.—July 1					
North Hudson Co. (N. J.) Ry. Co.	25	1,250,000	1,000,000	3% S.	180
Indianapolis, Ind.—July 1					
* Indianapolis Street Ry.	100	5,000,000	5,000,000		25 25 1/2
Lancaster, Pa.—July 1					
Pennsylvania Traction Co.	100	10,000,000	9,900,000		
Lancaster & Col. Electric Ry.	100	1,000,000	87,500		
West End Street Railway.	100	1,000,000			
Louisville, Ky.—July 1					
Louisville Ry. Co.	100	4,000,000	8,500,000	1% S. April.	82 88
Louisville Ry. pfd.	100	2,500,000	2,500,000	2% S. Oct. 1,	112 118
Minneapolis, Minn.—July 1					
Twin City Rapid Transit Co.	100	17,000,000	15,010,000		89 89 1/2
Twin City Rapid Transit Co. 7% pfd.	100	8,000,000	1,712,200	1% S. Oct.	186 187
Montreal, Canada.—July 1					
Montreal Street Ry. Co.	50	4,000,000	4,000,000	3% S. M. & N.	279 280
Toronto Street Ry. Co.	100	6,000,000	6,000,000	1% S. J. & J.	109 1/2 110 1/2
Memphis Tenn.—July 1					
Memphis Street Railway Co.	100	500,000	500,000		25
New Haven, Conn.—July 1:					
Fair Haven & Westville RR.	25	2,000,000	2,000,000	3% S. Sept.	89 91
New Haven Street Railway Co.	100	1,250,000	1,000,000	2% S. A., July	
New Haven & Centerville	100	700,000	800,000		
Winchester Avenue RR.	25	1,000,000	500,000		45 46
New Orleans, La.—July 1					
Canal & Claiborne RR. Co.	40	240,000	240,000	4% S. July,	
New Orleans & Carrollton RR.	100	1,200,000	1,200,000	1% S. Q., Oct.	148 1/2 149
New Orleans Traction Co. new com.	100				24 24 1/2
New Orleans Traction Co. new pfd.	100				95 96
a Crescent City RR. guar.	100	2,000,000	2,000,000	3% S. Jan.,	20 20 1/2
b New Or. City & Lake RR. guar.	100	2,000,000	2,000,000	4% S. Jan.,	
Orleans Railroad.	50	500,000	185,000	1% S. Jan.,	52 52 1/2
St. Charles Street Railway.	50	1,000,000	1,000,000	1% S. Oct.,	56 57
New York—July 1:					
Central Croton RR.	100	500,000	500,000	2% S. Q.	285 290
c Christopher & 10th Sts. RR. guar.	100	550,000	550,000	2% S. Q. Oct.	178 185
Dry Dock, E. B'way & Battery RR.	100	1,200,000	1,200,000	1% S. Q. Nov.	130 135
d Metropolitan Street Ry. Co.	100	45,000,000	45,000,000	2% S. Q., Feb. 1901.	173 1/2 173 3/4
e Bleeker St. & Fulton Fy. Ry. guar.	100	900,000	900,000	3% S. A., July,	46 47
f Broadway & Seventh Ave. guar.	100	2,100,000	2,100,000	2% S. Q.	240 245
g Gen. Park, N. & E. Rivers RR. guar.	100	1,800,000	1,800,000	2% S. Q.	206 210
h Eighth Avenue RR.	100	1,000,000	1,000,000		400 405
i 42d St. & Grand St. Ferry RR. guar.	100	750,000	748,000	4% S. Q.	392 402
j Ninth Avenue RR. guar.	100	800,000	800,000		198 200
k Sixth Avenue RR. guar.	100	2,000,000	2,000,000	4% S. Q.	206 210
l Twenty-third St. R. R. Co. guar.	100	600,000	600,000	4% S. Q.	400 410
Second Avenue RR.	100	2,500,000	1,800,000	2% S. Q., Jan.	210 212
Third Avenue RR.	100	12,000,000	10,000,000	\$1.75 p. sh. Feb.	120 1/2 120 3/4
m 42d St., Manhattan & St. Nich. Av.	100	2,500,000	2,500,000		65 75
* Union (Huckleberry) Ry.	100	2,000,000	2,000,000		190 200
Newark N. J.—July 1					
Consolidated Traction Co. of N. J.	100	15,000,000	8,000,000		67 1/2 68 1/2
North Jersey Railway Co.	100	6,000,000	5,000,000		25 26
United Elec. Co. of New Jersey.	100	504,000	504,000	1 1/2% S. A.	283 1/2 284
Pittsburg, Pa.—July 1					
Allegheny Traction Co.	50	500,000			27 28
o Consolidated Traction Co. com.	50	15,000,000		2% S. Jan.	25 25 1/2
Consolidated Traction Co. pfd.	50	9,478,850		3% S. Nov.	62 1/2 63
p Central Traction Co.	50	1,500,000		1 1/2% S. Nov.	78 1/2 79
q Citizens' Traction Co.	50	8,000,000		6% S. A.	72 1/2 73 1/2
r Duquesne Traction Co.	50	8,000,000		3% S. A.	
s Pittsburg Traction Co.	50	2,500,000		3% S. Nov.	
Federal St. & Pleasant Valley Ry.	25	1,400,000		2% S. July,	27 28
Pgh., Allegheny & Man. Trac. Co.	50	8,000,000		2% S. Aug.	
Pittsburg & Birmingham Trac. Ry.	25	1,500,000		1% S. Oct.	41 42 1/2
Pittsburg & West End Ry.	50	8,000,000		5% S. June	18 1/2 18 3/4
United Traction Co. com.	50	17,000,000		J. & J.	51 1/2 52
United Traction Co. pref.	50	8,000,000		J. & J.	

* Unlisted. † Ex div.

a The United Railways & Electric Company comprises in its organization the Baltimore Consolidated Railway Company, the Baltimore City Passenger Railway Company, all the lines of street railway operated by these companies, and also the Central Railway Co. of Baltimore. The pref. stock of U. R. & E. Co. has been issued in the form of income bonds.

b Leased to Boston Elevated Railroad Company.

c Owned by Brooklyn Rapid Transit Company.

d Leased to Brooklyn Heights Railroad Co., which guarantees 10% on capital stock.

e Stock owned by Brooklyn Rapid Transit Company; road operated by Brooklyn Hts. Co.

f Stock owned by Kings County Traction Company; road leased to Nassau Electric RR.

g Owned by Atlantic Ave. RR. and leased to Nassau system.

h \$30 per share on outstanding capital paid as rental by lessee—West Chicago St. RR. Co.

i \$250 100 of stock owned by Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

j Controls by lease Chicago West Division Railway, Chicago Passenger Railway, and West Chicago Street Railroad Tunnel Company.

k \$5 per annum paid on outstanding capital as rental by lessee—North Chicago Street Railroad Company. \$625,100 of stock owned by West Chicago Street Railroad Company.

l Majority of stock owned by Chicago West Division Railway Company; 5% on \$1,000,000 stock guaranteed by West Chicago Street Railroad Company, lessee.

m Cincinnati St. Railway purchased the Mt. A. & Eden Park road, assuming its bonds.

* Unlisted. † Full paid. ‡ Outstanding. § Ex div.

a Leased to New Orleans Traction Company at 6% on stock.

b Leased to New Orleans Traction Company at 8% on stock.

c Leased to Central Croton Traction Company at 8% on stock.

d Operating the former Met. Trac. system, that corporation having become extinct.

e Leased to 23d Street Ry. for 99 years; lease assigned to Metropolitan Street Ry.

f Leased to Houston, West Street & Payson Ferry—now Metropolitan Street Railway.

g Leased to Metropolitan Street Ry. at 8% on stock until Oct. 1, 1897; thereafter 9%.

h Leased to Metropolitan Street Ry. for 99 years from Jan. 1, 1893, at \$215,000 per annum.

i Leased to Metropolitan Street Railway for 18% on stock.

j Leased to Met. St. Ry. for 99 years from April 1, 1892; 6% first 5 years, 8% thereafter.

k Leased to Metropolitan Street Railway for \$145,000 per annum.

l Leased to Metropolitan Street Railway for 18% on capital stock.

m Controlled by Third Avenue Railroad by purchase.

n Dividends of 1 1/2% yearly guaranteed by Consolidated Traction Company.

o Controls by lease the Allegheny, Cent., Citizens' Duquesne, Fort Pitt & Pitt's Traction.

p Leased to Consolidated Traction Company for 8% per annum on par value of stock.

q Leased to Fort Pitt Traction Company for 6% on \$8,000,000 capital stock.

r Leased to Consolidated Traction Company for 4% on capital stock.

s Leased to Consolidated Traction Company for 7% on capital stock.

TELEPHONE AND TELEGRAPH COS.

PASSENGER RAILWAYS.

PASSENGER RAILWAYS.													
NAME.	Par	Capital Stock.		Rate and Date of Last Div.	Eld.	Asked.	NAME.	Par	Capital Stock.		Rate and Date of Last Div.	Eld.	Asked.
		Author'd	Issued.						Author'd	Issued.			
New Bedford Mass.—July 1													
Union Street Railway Co.	100	\$850,000	\$850,000	2%, Feb.	160	165							
Northampton, Mass.—July 1													
Northampton Street Ry.	100	800,000	225,000	4% A., June.	170	178							
Omaha, Neb.—July 1													
Omaha Street Ry.	100	5,000,000	5,000,000	3% A. and N.	55	65							
Paterson N. J.—July 1													
Paterson Ry. Co.	100	1,250,000	1,250,000	.....	54	—							
Providence, R. I.—July 1													
United Traction & Electric Co.	100	8,000,000	8,000,000	1/4%, Oct.	169	110							
Philadelphia.—July 1													
Fairmount Park Trans. Co.	50	2,000,000	1,770,000	2%, Dec.	28	24							
Hestonville, Man. & Fairmount	50	1,966,100	1,966,100	2 1/2%, July 15.	47	48							
Hestonville, Man. & Fairmount	50	583,900	583,900	8% S—July.	75	76							
aFairmount Pk. & Had. Pass. Ry.	50	800,000	800,000	8% Feb. 1.	27 1/2	28							
Union Traction Co.	50	80,000,000	29,980,450	.....	30	30 1/2							
aElectric Traction Co.	50	.....	8,297,920	.....	—	—							
aCitizens' Passenger Ry.	50	500,000	192,500	88 share Q.	445	—							
aFrankford & Southwark Pass. Ry.	50	1,000,000	1,875,000	\$14 share A—Apr.	40	451							
aLehigh Avenue Ry. Co.	50	1,000,000	1,000,000	A. & O.	90	90 1/2							
aLombard & South Street Ry.	25	.....	771,076	89 share A, Mar.	800	—							
aSecond & Third Streets Ry.	50	1,000,000	16,000,000	8%, A., April.	150	151							
aPeople's Traction Co.	50	1,500,000	572,800	\$5.25 share—	151	152							
aGermantown Passenger Ry.	50	500,000	150,000	8% Jan.,	—	—							
aGreen & Oates Passenger Ry.	50	500,000	740,000	.....	—	—							
aPeople's Passenger Ry.	25	1,500,000	277,402	.....	—	—							
aPeople's Passenger Ry. pfd.	50	750,000	277,402	.....	95	95 1/2							
aPhiladelphia Traction Co.	50	30,000,000	120,000,000	32 p. sh. Oct.	158	157							
aCatherine & Bainbridge St.	50	1,000,000	400,000	6% A—Mar.	158	157							
aContinental Pass. Ry. guar.	50	1,000,000	400,000	6% share—July	108	208 1/2							
aEmpire Passenger Ry. Co.	50	1,000,000	475,000	\$7.50 share July	108	208 1/2							
aPhiladelphia City Pass. Ry.	50	1,000,000	298,650	\$8.50 share July	108	208 1/2							
aPhiladelphia & Gray's Ry. RR.	50	1,000,000	420,000	\$12 share, July	108	208 1/2							
aRidge Avenue Passenger Ry.	50	750,000	200,000	\$12 share July,	—	—							
aPhiladelphia & Dart. Ry. guar.	50	750,000	200,000	1 1/2% S., July,	—	—							
a17th & 19th Sts. Pass. Ry. guar.	50	1,000,000	885,000	1 1/2% S., July,	300	—							
aThirteenth & 15th Sts. Pass. Ry.	50	1,000,000	885,000	1 1/2% S., July,	300	—							
aUnion Passenger Ry. Co.	50	1,500,000	900,000	\$9.50 sh. July,	49	240							
aWest Philadelphia Pass. Ry.	50	750,000	750,000	\$10 share, July,	62	268							
Rochester, N. Y.—July 1													
Rochester Railway Co.	100	5,000,000	5,000,000	.....	25	28							
Reading, Pa.—July 1													
Reading Traction Co.	100	1,000,000	1,000,000	Semi-ann., Jan. & July	24	26							
aCity Passenger Ry.	50	850,000	850,000	Jan.,	188	—							
aEast Reading Electric Ry.	50	1,000,000	1,000,000	Jan.,	70	—							
St. Louis Mo.—July 1													
Fourth Street & Arsenal Ry.	50	800,000	150,000	.....	—	—							
Jefferson Avenue Ry. Co.	50	400,000	400,000	2% Dec.	—	—							
Lindell Ry.	100	2,500,000	2,400,000	1 1/2% Jan.	—	—							
National Railway Co.	100	2,500,000	2,479,000	1% Jan.	—	—							
Cass Avenue & Fair Grounds.	100	2,500,000	2,500,000	.....	—	—							
Citizens' RR.	100	2,000,000	1,500,000	4% Oct.	—	—							
St. Louis RR.	100	2,000,000	2,000,000	2% Jan.,	—	—							
Missouri RR.	50	2,400,000	2,300,000	1 1/2% Jan.,	—	—							
People's RR. Co.	50	1,000,000	800,000	50c., Dec.	24	25							
United Electric Ry.	100	500,000	500,000	.....	78 1/2	79							
United Electric Ry.	100	1,000,000	1,000,000	8% Jan.,	90	93							
St. Louis & Suburban Ry.	100	800,000	2,500,000	.....	—	—							
Union Depot RR.	100	4,000,000	4,000,000	8% A., July,	—	—							
San Francisco, Cal.—July 1													
California St. Cable RR.	100	1,000,000	600,000	50c. monthly.	117	119							
Geary Street Park & Ocean RR.	100	1,000,000	875,000	\$2.50 share,	60	—							
Market Street Ry.	100	18,750,000	18,750,000	Q., 60c. per share.	61 1/2	68 1/2							
Presidio & Ferries RR.	100	1,000,000	550,000	.....	—	—							
Scranton Pa.—July 1													
Scranton Railway Co.	50	6,000,000	2,500,000	.....	29	80							
Scranton & Carbondale Trac. Co.	100	500,000	500,000	.....	15 1/2	—							
Scranton & Pittston Traction Co.	100	1,060,000	1,060,000	.....	—	—							
Springfield Ill.—July 1													
Springfield Consolidated Ry.	100	750,000	750,000	.....	—	—							
Springfield O.—July 1													
Springfield Street Ry.	100	1,000,000	1,030,000	.....	—	11							
Springfield, Mass.—July 1													
Springfield Street Ry.	100	1,200,000	1,166,700	8% A.	207	212							
Toronto Canada.—July 1													
Toronto Street Ry.	100	6,000,000	6,000,000	1 1/2% S.	109 1/2	119 1/2							
Montreal Street Railway Co.	100	4,000,000	4,000,000	4% S.	279	280							
Washington, D. C.—July 1													
Belt Ry. Co.	50	500,000	500,000	.....	103 1/2	103 1/2							
Capital Traction Co.	100	12,000,000	12,000,000	65c. per sh. Oct.	85	40							
Columbia Ry. Co.	50	400,000	400,000	6% A.	85	40							
Rockington & Soldiers Home Ry.	50	707,000	652,000	.....	20	21							
Georgetown & Tenallytown Ry.	50	200,000	200,000	.....	—	—							
Metropolitan RR. Co.	50	1,000,000	458,900	2% Q.	—	—							
Worcester, Mass.—July 1													
Worcester Traction Co.	100	8,000,000	8,000,000	.....	87 1/2	35							
Worcester Traction Co.	100	2,000,000	2,000,000	8% S., Feb.,	107	108							
Worcester & Suburban Street Ry.	100	550,000	642,500	4 1/2%,	—	85							
Wilkesbarre, Pa.—July 1													
Wilkesbarre & Wyoming Val Trac.	100	5,000,000	5,000,000	1% Jan.,	25	26							

BOSTON, MASS.—July 1											
American Tel. & Tel. Co.	100	80,000,000	28,850,000	4% Q. Jan.	155 1/2	155 1/2					
Erle Telegraph & Telephone Co.	100	80,000,000	10,894,800	1% Q., Feb. 20.	141	141					
New England Telephone Co.	100	10,894,800	10,894,800	\$1.50 p. sh. Feb.	141	141					
New York.—July 1											
American Telegraph & Cable Co.	100	14,000,000	14,000,000	1% Q.	91	94					
*Central & South Am. Tel. Co.	100	6,500,000	6,500,000	1% Q.	100	105					
*Commercial Cable Co.	100	10,000,000	10,000,000	1% Q.	178	175					
*Franklin Tel. Co.	100	1,000,000	1,000,000	1% Q.	42	50					
Erle Telegraph & Telephone Co.	100	5,000,000	4,800,000	1% Q., Feb.	108	109					
*Gold & Stock Tel. Co. guar. 6%	100	5,000,000	4,800,000	1% Q.	116	114					
*International Ocean Tel. Co. guar. 6%	100	8,000,000	8,000,000	1% Q.	108	109					
Mexican Telephone Co.	100	2,000,000	2,000,000	.....	116	114					
*New York & New Jersey Tel. Co.	100	5,000,000	3,722,000	2% Q., Jan.	168	178					
*Pacific & Atlantic Tel. Co.	25	2,000,000	2,000,000	2% S.	70	75					
*Postal Telegraph Cable Co.	100	15,000,000	15,000,000	1% Q.	95	100					
*South & Atlantic Tel. Co. guar. 5%	25	950,000	599,525	2% S.	118	—					
*Commercial Union Telegraph Co.	25	500,000	500,000	2% S., Jan.	93 1/2	93 1/2					
Western Union Telegraph Co.	100	97,870,000	97,870,000	1 1/2% Q., Jan.	93 1/2	93 1/2					
†Div. guar. by Postal Tel. Co.	—	—	—	.....	—	—					
Miscellaneous.—July 1											
American Dist. Tel. (Phila.)	25	400,000	400,000	1% Q.	26	27					
Bell Tel. Co. (of Canada)	100	8,960,000	8,960,000	2% S.	188	—					
Chesapeake & Potomac Tel. Co.	100	750,000	750,000	.....	200	210					
Chicago Telephone Co.	100	750,000	750,000	.....	148	150					
Central Dist. Pkg. & Tel. Co. (Phg.)	100	750,000	750,000	.....	176	176					
Empire & Bay States Telephone Co.	109	2,000,000	2,000,000	1% Q.	120	125					
Hudson River Telephone Co.	50	2,500,000	2,500,000	2 1/2% Q.	122	125					
*Northwestern Telegraph Co. guar.	50	2,500,000	2,500,000	2 1/2% Q.	122	125					
Providence (R. I.) Tel. Co.	100	8,000,000	8,000,000	.....	96	99					
Southern New Eng. Tel. Co.	100	8,000,000	8,000,000	.....	96	99					

ELECTRIC LIGHT AND ELECTRICAL MFG. CO.											
Boston, Mass.—July 1											
Fort Wayne Electric trust receipts.	25	.....	.....	.....	115	125					
Edison Elec. Co. T. Sec. Series A.	100	40,000,000	40,000,000	2% Q., Aug., 1898.	267	267 1/2					
*General Electric Co. [old] com.	100	18,276,000	18,276,000	1% Q., Apr., 1901.	267	267 1/2					
General Electric Co. [new]	100	18,276,000	18,276,000	1% Q., Apr., 1901.	267	267 1/2					
T. H. Elec. Co. T. Sec. Series C.	50	146,700	146,700	1% Q., Jan.	70	70 1/2					
Westinghouse Elec. & Mfg. Co. pfd.	50	4,000,000	3,996,058	1% Q., Jan.	75 1/2	76					
Westinghouse El. & Mfg. Co. rights.	50	11,000,000	8,196,126	.....	174	174					
New York.—July 1											
Edison Elec. Ill'g Co., New York.	100	9,188,000	7,988,000	1% Q., Oct., '98.	119	125					
*Edison Elec. Ill'g Co., Brooklyn.	100	4,000,000	2,988,000	1% Q., Oct., '98.	8	12					
Edison Ore Milling Co.	100	.....	.....	.....							

BONDS.

PASSENGER RAILWAY.

PASSENGER RAILWAY.

NAME.	Amount.						NAME.	Amount.					
Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.		Authorized.	Issued.	Due	Interest periods.	Bid.	Asked.	
Albany N. Y.													
Date of Quotation—July 1, 1901.													
The Albany Ry. Co. Cons. mtg. 5s	850,000	427,500	1940	J & J.	117½								
The Albany Ry. Co. Gen. mtg. 5s	750,000	875,000	1947	M. & N.	116½								
Watervliet Turnpike & RR. 1st mtg. 5s	850,000	850,000	1919	M. & N.	1125								
Watervliet Turnpike & RR. 2d mtg. 5s	150,000	150,000	1919	M. & N.	1124								
Troy City Railway Co. 1st 5s	.....	.....	1942	.....	116								
Interest guar. by Albany Ry. Co. Principal and interest guar. by Albany Ry. Co.													
Baltimore Md.													
Date of Quotation—July 1, 1901.													
United Electric Ry. Co. 1st mtg. g. 4s	88,000,000	18,000,000	1949	M. & S.	102	102½							
..... Income 4s	14,000,000	.....	1949	J. & D.	748	75							
Baltimore City Pass. Ry. 1st mtg. g. 5s	2,000,000	2,000,000	1911	M. & N.	118½								
Baltimore Traction Co. 1st mtg. 5s	1,500,000	1,500,000	1929	M. & N.	119	120							
Baltimore Trac. Co. Exten. & Imp. g. 5s	1,250,000	1,250,000	1901	M. & S.	104½								
Bal. Trac. Co. No. Balto div. 1st mtg. g. 5s	1,750,000	1,750,000	1942	J. & D.	121	121½							
Bal. Trac. Co. Coll. Trust 1st mtg. g. 5s	750,000	.....	1900	J. & J.	101								
Baltimore Traction Co. Convertible 5s	800,000	.....	1906	N. & M.	102½								
Central Pass. Ry. Co. 1st mtg. 6s	96,000	117,000	1912	J. & J.	.....								
Central Pass. Ry. Co. Cons. mtg. g. 5s	804,000	880,000	1922	M. & N.	119	121							
City & Suburban Ry. 1st mtg. g. 5s	8,000,000	8,000,000	1922	J. & D.	116	117							
Lake Roland Elev. 1st mtg. 5s	1,000,000	1,000,000	1942	M. & S.	117								
All of the bonds of the above companies, marked †, have been assumed by the United Railways & Electric Company.													
Boston Mass.													
Date of Quotation—July 1, 1901.													
Lynn & Boston RR. 1st mtg. g. 5s	5,879,000	3,702,000	1924	J. & D.	114	115							
West End Street Ry. Deben. g. 5s	8,000,000	3,000,000	1902	M. & N.	104½	106							
West End Street Ry. 1st mtg. g. 4½s	2,000,000	2,000,000	1914	M. & S.	112								
†\$1,074,000 in escrow to retire outstanding bonds of absorbed companies.													
Charleston S. C.													
Date of Quotation—July 1, 1901.													
Enterprise Street RR. 1st mtg. 5s	500,000	47,000	1906	J. & J.	.....								
Charleston City Ry. 1st mtg. 5s	850,000	.....	.....	J. & J.	106								
†Controlled by Charleston St. Ry. Co.													
Chicago Ill.													
Date of Quotation—July 1, 1901.													
Chicago City Ry. 1st mtg. 4½s	6,000,000	4,619,500	1901	J. & J.	101½	102½							
Chicago Passenger Ry. 1st mtg. 5s	400,000	400,000	1908	F. & A.	.....	102							
Chicago Passenger Ry. Cons. mtg. 5s	1,000,000	600,000	1929	J. & D.	.....	.....							
Chicago & So. Side R. T. 1st mtg. g. 5s	7,500,000	7,500,000	1929	A. & O.	.....	.....							
Chicago & So. Side R. T. 2d mtg. 5s	1,500,000	750,000	1907	J. & J.	.....	.....							
Chicago West Div. Ry. 1st mtg. 4½s	4,040,000	4,040,000	1922	J. & J.	108½	109							
Lake Street Elevated RR. 1st mtg. g. 5s	7,574,000	8,781,200	1928	J. & J.	.....	.....							
Metrop. W. Side Elev. Ry. 1st mtg. g. 5s	15,000,000	15,000,000	1942	F. & A.	96	96½							
North Chicago St. RR. 1st mtg. 5s	8,171,000	8,171,000	1942	J. & J.	106	.....							
North Chicago St. RR. Cert. Indeb. 5s	500,000	500,000	1911	J. & J.	.....	.....							
North Chicago City Ry. 1st mtg. 5s	500,000	500,000	1900	J. & J.	.....	.....							
North Chicago City Ry. consol. 4½s	2,500,000	2,500,000	1927	M. & N.	108	.....							
West Chicago St. RR. 1st mtg. 5s	4,100,000	8,969,000	1928	M. & N.	.....	111							
West Chicago St. RR. Deben. 5s	2,700,000	700,000	1911	J. & D.	101	102							
West Chicago St. RR. Cons. mtg. g. 5s	12,500,000	6,000,000	1906	.....	106½	107							
W. Chicago St. RR. Tunnel. 1st mtg. 5s	1,500,000	1,500,000	1909	F. & A.	.....	.....							
†Redeemable at option on 60 da. notice.													
†Funded debt assumed by Chicago W. Div. Ry. Co., controlling interest of which is owned by W. Chicago St. RR. Co., lessee.													
†Subject to call after Oct. 1, 1899, at 110 and interest.													
†Assumed by W. Chi. RR. Co., lessee.													
†Int. guar. by W. Chicago St. RR. Co.													
Cincinnati O.													
Date of Quotation—July 1, 1901.													
Cin. New. & Cov. St. Ry. 1st Con. mtg. g. 5s	8,000,000	2,500,000	1922	J. & J.	114½	115							
†Mt. Adams & Eden Pk In. 1st mtg. 5s	46,000	46,000	1900	A. & O.	108½	104							
†Mt. Adams & Eden Pk In. 1st mtg. 5s	100,000	100,000	1905	A. & O.	114	.....							
†Mt. Adams & Eden Pk Inc. Cons. mtg. 5s	581,090	581,000	1906	M. & S.	108½	.....							
So. Cov. & Cin. St. Ry. 1st mtg. 5s	250,000	250,000	1912	M. & S.	121½	122½							
So. Cov. & Cin. St. Ry. 2d mtg. 5s	400,000	400,000	1922	J. & J.	132½	137							
†Assumed by the Cin. St. Ry. Co.													
†\$250,000 reserved to retire 1st mtg. bds.													
Cleveland O.													
Date of Quotation—July 1, 1901.													
Brooklyn Street RR. Co. 1st mtg. 5s	600,000	600,000	1908	M. & S.	106½	107							
Cin. New. & Cov. St. Ry. Cons. mtg. 5s	8,000,000	2,500,000	1922	J. & J.	118½	114½							
Cleveland City Cable Ry. 1st mtg. 5s	2,000,000	2,000,000	1909	J. & J.	105½	106							
†Cleveland Electric Ry. Co. 1st mtg. g. 5s	8,500,000	1,249,000	1918	M. & S.	106	107							
Columbus (O.) Cent. Ry. 1st mtg. g. 5s	1,500,000	1,500,000	1918	M. & N.	.....	.....							
East Cleveland RR. 1st mtg. 5s	1,000,000	1,000,000	1910	M. & S.	.....	107½							
Fl. Wayne (Ind.) Elec. Ry. 1st mtg. g. 5s	600,000	.....	1922	M. & N.	.....	.....							
Lorain (O.) Street Ry. 1st mtg. 5s	200,000	200,000	1915	J. & J.	.....	.....							
St. Ry. Co., Grand Rapids. 1st mtg. 5s	600,000	600,000	1912	J. & D.	.....	.....							
†\$1,900,000 in escrow to retire bonds of absorbed companies, marked a.													
Interest guar. by Cons. St. Ry. Co.													
Detroit Mich.													
Date of Quotation—July 1, 1901.													
†Detroit Citizens' St. Ry. 1st mtg. 5s	7,000,000	8,885,000	1905	A. & O.	.....	102½							
Fl. Wayne & Belle Isle Ry. 1st mtg. 5s	400,000	377,000	1902	A. & O.	.....	.....							
The Detroit Ry. 1st mtg. 5s	1,800,000	1,800,000	1925	J. & D.	105	106½							
†\$1,150,000 in escrow to retire bonds of Det. City Ry. and Grand River St. Ry.													
New Haven Conn.													
Date of Quotation—July 1, 1901.													
New Haven St. Ry. 1st mtg. g. 5s	600,000	600,000	1918	J. & D.	111	.....							
New Haven (Edgewood Div.) 1st mtg. 5s	250,000	250,000	1914	J. & D.	111	.....							
Witchester Avenue RR. 1st mtg. g. 5s	100,000	500,000	1915	M. & N.	109	.....							
Witchester Avenue RR. Deben. g	100,000	24,000	1915	M. & S.	.....	.....							
With interest Unlisted													
New Orleans La.													
Date of Quotation—July 1, 1901.													
Canal & Chalborne RR. cons mtg. 5s	\$150,000	\$150,000	1919	M. & N.	.....	.....							
Creole City RR. 1st mtg. 5s	.....	50,000	1899	M. & N.	105½	.....							

PASSENGER RAILWAY.

NAME.	Amount.		Due	Interest periods.	Bid.	Asked.
	Authorized.	Issued.				
St. Louis.						
Date of Quotation—July 1 1901.						
Jefferson Avenue Ry.....1st mtg. 6a.	270,000	270,000	1905	M. & N.	162	168
Lindell Ry. Co.....1st mtg. 6a.	1,800,000	1,800,000	1911	F. & A.	107	118
Missouri RR. Co.....1st mtg. 6a.	1,000,000	700,000	1916	M. & N.	106	108
Mount City RR. Co.....1st mtg. 6a.	400,000	800,000	1910	A. & O.	104½	105½
People's RR. Co.....1st mtg. 6a.	125,000	125,000	1902	J. & D.	.....	.....
People's RR. Co.....3d mtg. 7a.	75,000	75,000	1902	M. & N.	.....	.....
People's RR. Co.....3d mtg. 7a.	1,000,000	800,000	1904	J. & J.	.....	.....
St. Louis & E. St. L. Electric 1st mtg. 6a.	75,000	75,000	1905	J. & J.	100	101
St. Louis RR. Co.....1st mtg. 6a.	2,000,000	2,000,000	1900	M. & N.	99½	100½
St. Louis & Sub. Ry.....1st mtg. 6a.	2,000,000	1,400,000	1921	F. & A.	108	104
St. Louis & Sub. Ry.....1st mtg. 6a.	800,000	800,000	.....	.....	80	84
St. Louis & Sub. Ry.....Income 6a.	800,000	800,000	1909	M. & N.	106	108
Southern Electric Ry.....Cons. mtg. 6a.	500,000	500,000	1912	J. & J.	116½	117½
Taylor Avenue St. Ry.....1st mtg. 6a.	1,091,000	1,091,000	1900	A. & O.	100	100½
Union Depot RR. Co.....1st cons. mtg. 6a.	8,500,000	1,787,000	1912	J. & J.	121	122
Union Depot RR. Co.....Cons. mtg. 6a.	.....	.....	.....	.....	.....	.....
Controlled by St. Louis RR. Co.	.....	.....	.....	.....	.....	.....
Controlled by Union Depot RR. Co.	.....	.....	.....	.....	.....	.....
Controlled by Lindell RR. Co.	.....	.....	.....	.....	.....	.....
\$200,000 in escrow to retire 1st & 2d mtg.	.....	.....	.....	.....	.....	.....
\$200,000 in escrow.	.....	.....	.....	.....	.....	.....
\$200,000 in escrow to retire 1st mtg.	.....	.....	.....	.....	.....	.....
San Francisco Cal.						
Date of Quotation—June 1901.						
California St. Cable RR.....1st mtg. 6a.	1,000,000	800,000	1915	J. & J.	114	117
Ferries & Cliff House Ry.....1st mtg. 6a.	650,000	650,000	1914	M. & N.	.....	117
Geary St., Park & Ocean RR.....1st mtg. 6a.	1,000,000	671,000	1921	A. & O.	.....	95
Market St. Cable Ry. Co.....1st mtg. 6a.	8,000,000	8,000,000	1915	J. & J.	126½	.....
Metropolitan Ry. Co.....1st mtg. 6a.	200,000	.....	.....	.....	.....	.....
Metropolitan Ry. Co.....1st mtg. 6a.	2,000,000	2,000,000	1918	A. & O.	126½	.....
Omnibus Cable Co.....1st mtg. 6a.	850,000	850,000	1912	J. & J.	105½	107
Park & Cliff House RR.....1st mtg. 6a.	250,000	250,000	1914	J. & J.	115	.....
Park & Ocean RR.....1st mtg. 6a.	700,000	700,000	1912	M. & N.	.....	125
Powell St. Ry.....1st mtg. 6a.	1,000,000	800,000	1912	M. & N.	.....	.....
Sutter St. Ry. Co.....1st mtg. 6a.	.....	.....	.....	.....	.....	.....
Controlled by Market St. Ry. Co.	.....	.....	.....	.....	.....	.....
Washington D. C.						
Date of Quotation—July 1, 1901						
Belt Ry. Co.....Cons. mtg. 6a.	500,000	450,000	1920	J. & J.	.....	...
Columbia Ry.....1st mtg. 6a.	500,000	500,000	1914	A. & O.	123	.....
Rockington & Soldiers' Home Ry. Co.	200,000	200,000	1911	J. & D.	.....	.....
Metropolitan RR. Co.....Coll. tr. cons. 6a.	500,000	500,000	1901	J. & J.	.....	.....
\$50,000 in escrow to retire 1st mtg. bds.	.....	.....	.....	.....	.....	.....
Miscellaneous.						
Date of Quotation—July 1, 1901						
Bridgeport Tract. Co.....1st mtg. 6a.	2,000,000	1,025,000	1928	J. & J.	108	110
Buffalo (N. Y.) Ry. Co.....Cons. mtg. 6a.	5,000,000	5,545,000	1921	F. & A.	118	.....
Citizens' St. R. (Ind. polis.) 1st cons. mtg. 6a.	4,000,000	5,000,000	1922	M. & N.	104	107
Crooktown St. Ry. (Buffalo) 1st mtg. 6a.	5,000,000	2,555,000	1922	M. & N.	112	118
Columbus (O.) St. Ry. 1st cons. g. 6a.	5,000,000	2,261,000	1922	J. & J.	115	.....
Consolidated Traction (N. J.) 1st mtg. 6a.	15,000,000	15,965,000	1922	J. & D.	111½	111½
Crooktown St. Ry. (Col'd's) 1st mtg. 6a.	2,000,000	573,000	1920	J. & D.	115	115½
Denver City Cable Ry.....1st mtg. 6a.	4,000,000	8,800,000	1920	J. & J.	80	.....
Denver Con. Tram'y Co.....Cons. mtg. 6a.	4,000,000	922,000	1920	A. & O.	90	95
Levellville (Ky.) Ry. 1st cons. mtg. 6a.	5,000,000	4,921,000	1920	J. & J.	119	119½
Minneapolis St. Ry. 1st cons. mtg. 6a.	5,000,000	4,050,000	1919	J. & J.	110½	110½
Mo. Hudson Co. Ry. (N. J.) Cons. mtg. 6a.	8,000,000	2,878,000	1922	J. & J.	108	.....
Mo. Hudson Co. Ry. (N. J.) 3d mtg. 6a.	500,000	550,000	1922	M. & N.	.....	.....
Mo. Hudson Co. Ry. (N. J.) Deb. 6a.	500,000	489,000	1902	F. & A.	.....	.....
Paterson (N. J.) Ry. Cons. mtg. 6a.	1,250,000	1,000,000	1921	J. & D.	.....	.....
Rochester (N. Y.) Ry. 1st mtg. 6a.	5,000,000	2,000,000	1920	A. & O.	.....	.....
St. Paul City Ry. Cons. g. 6a.	5,500,000	4,298,000	1927	.....	105½	106
St. Paul City Ry. Deb. g. 6a.	1,000,000	1,000,000	1900	.....	108	...
\$11,000,000 in escrow to retire 1st and 2d mtg. bds.	.....	.....	.....	.....	.....	.....
\$200,000 in treasury. Bonds guar. by Buffalo Ry. Co.	.....	.....	.....	.....	.....	.....
\$275,000 in escrow to retire bonds of C. St. RR. Co.	.....	.....	.....	.....	.....	.....
\$287,000 in treasury.	.....	.....	.....	.....	.....	.....
\$250,000 reserved to red. w. prior liens	.....	.....	.....	.....	.....	.....
\$220,000 in escrow.	.....	.....	.....	.....	.....	.....
*With Int'r.						

*With Int'r.

ELECTRIC LIGHT AND ELECTRICAL MFG. CO'S

Boston, Mass.						
Date of Quotation—July 1, 1901						
Delaware Gas Lt. Co.....1st m. 6a. g.	800,000	800,000	.....	J. & J.	106	10
Edison Elec. Illuminating Co., Boston.....	2,025,000	.....	.....	Quar.	157	.....
General Electric Co. gold coup. deb. 6a.	10,000,000	8,750,000	1922	.....	116	.....
Pittsburg Pa.						
Date of Quotation—July 1, 1901						
Allegheny County Light Co.....6a.	500,000	.....	1911	J. & J.	110	.....
Westinghouse Elec. & Mfg. Co. Serip 6a.	195,570	.....	.....	M. & N.	.....	.....
Miscellaneous.—(July 1 1901)						
Edison El. Ilg. Co. (N. York) 1st m. 6a.	4,812,000	4,812,000	1910	.....	109	.....
Edison El. Ilg. Co. (N. Y.) con. m. g. 6a.	15,000,000	2,188,000	1928	.....	124	.....
Edison El. Ilg. Co. (Brooklyn).....	5,000,000	5,000,000	1940	.....	122½	124
Edison Electric Light (Philadelphia).....	2,000,000	.....	.....	.....	.....	.....
Kings Co. El. Lt. & Pow. Co. 1st mtg. 6a.	2,500,000	.....	1927	A. & O.	100	105
Kings Co. El. Lt. & Pow. Co. pur. money 6a.	5,175,000	.....	1927	A. & O.	120	122
Milwaukee El. Ry. & Lt. Co. 1st con. g. 6a.	8,000,000	.....	.....	F. & A.	102½	.....
United Elec. Light & Power Co. (N. Y.).....	5,000,000	.....	.....	.....	.....	.....

TELEPHONE AND TELEGRAPH.

Miscellaneous.						
Date of Quotation—July 1 1901.						
American Bell Telephone.....4a.	.....	.....	1908	F. & A.	100½	101
Northwestern Telephone Co.....7a.	.....	.....	.....	.....	.....	.....
N. Y. & N. J. Tel. & Tel. Co. gen. mtg. 6a.	.....	.....	.....	.....	114	115
Chesapeake & Potomac Teleph. Co.....5a.	.....	.....	1911	J. & D.	108	114

ALLIED INDUSTRIES.

Miscellaneous.						
Date of Quotation—July 1 1901.						
American Electric Heating.....7a.	500,000	500,000	.....	.....	.....	.....
Armington & Sims Engine Co.....6a.	.....	.....	.....	.....	.....	25
Barray & Smith Car Co.....6a.	.....	.....	1942	J. & J.	108	107
Carbideum Mfg. Co.....6a.	.....	.....	1904	J. & D.	.....	.....
Westinghouse Pump Co.....7a.	75,000	.....	.....	.....	115	127
Galileo	.....	.....	.....	.....	.....	.....

NOTES FOR INVESTORS.

Late quotations for copper are: Electrolytic, 16½@17c.; Lake, 17@17½c.; casting, 16½@16¾c.

Eight wireless telegraph companies, with \$5,000,000 capital, have been incorporated at Pierre, S. D.

Little credence is attached to rumors of a strike on the part of Philadelphia Union Traction employees.

The Edison Electric Illuminating Company of Savannah, Ga., has declared the regular semi-annual dividend of 3 per cent., payable July 1 to stock of record June 30.

According to directors of both companies, the prospect is that there will be no consolidation of the Electric Company of America and the American Railways Company.

Stockholders of the Chicago Union Traction Company will hold their annual meeting July 23, at which several changes in the personnel of the management are expected to be made.

The return this week of P. A. B. Widener and William L. Elkins is expected to be followed almost immediately by the completion of the Philadelphia Company, Consolidated Traction of Pittsburg deal.

The following are quotations for some of the industrial stocks not quoted elsewhere: Electrical Lead Reduction, 3@3½; Electric Boat, 19@20; Electric Vehicle, 9@10; Tel. & Tel. Company of America (full paid), 4@6½; Electric Company of America, 7@7½; National Carbon, 16@18.

Judge Thomas of Cleveland, O., has accepted the presidency of the Telephone, Telegraph & Cable Company of America. The Consolidated Telephone & Telegraph Company, with \$12,000,000 capital stock, will be incorporated in Delaware to father a number of independent companies between Boston and Chicago.

A dispatch from Port Jervis, N. Y., says that New York capitalists, represented by R. H. Beach, vice-president of the General Electric Company, and Charles K. Horn, of this city, have bought the stock of the Port Jervis Street Railway Company and the Port Jervis Light & Power Company with a view of extending the road. The Port Jervis Company is also said to be included in the deal, and that negotiations are in progress for the purchase of the Deer Park Electric Light Company.

Vice-Chancellor Pitney in Jersey City on Monday denied an application to restrain the New York Electric Vehicle Transportation Company from collecting a second installment of 10 per cent. upon its stock, which had been ordered by the Board of Directors on May 7. The ground upon which the application was sought was that the money was not needed and that the purpose for which it was demanded was to promote the private interests of certain stockholders who were interested in another corporation.

The Boston committee on stock list recommends that \$15,000,000 from 4 per cent. collateral trust coupon bonds of 1929 be admitted to the Stock Exchange list. The committee further recommends that it have power to list \$94,237,500 capital stock upon completion of arrangements for transfer of said stock in New York; and further, that it may add to the list from time to time \$20,709,000 additional of said stock on official notification that the same has been paid for, issued and delivered.

Monday was dividend day in Wall Street and the semi-annual disbursements due July 1 were paid by perspiring tellers to long lines of messenger boys who were to be seen at all the leading downtown banks and trust companies. Coupons came in bags, by the hundred and in ones and twos, but each had to be counted and carefully destroyed after the payments had been made. No accurate estimate could be made as to the amount which was paid out, but several banks and trust company officials state that at least \$75,000,000 was paid out or changed from one account to another.

The lease of the Brooklyn Union Elevated to the Brooklyn Heights Railroad Company has been filed at Albany with the Secretary of State to expire June 30, 1900. The lessee covenants to pay annually in quarterly installments all reasonable expenses of maintaining the corporate existence of the lessor company not exceeding \$3,000 a year, and the lessee further agrees as part of rental to pay to lessor company before each September 30, after June 30, 1902, until, including September 30, 1900, all of the annual earnings received by lease from the operation of the Brooklyn Union.

This week there will be a home coming of a number of powerful men in the world of finance, and the rank and file are looking for a fresh outburst of speculation. J. P. Morgan is expected to reach New York City on Thursday next, and on the same boat on which he arrives will be a number of other gentlemen who have been prominent in Stock Exchange affairs. Many others who have been away are also expected to be in the city this week, and the several meetings to be held will bring together an aggregation of capitalists seldom before assembled in New York City at one time.

The Boston "News Bureau" says: The buying of the Massachusetts Electric securities is characterized as of the best and by people who are looking to the future of the property rather than the present. No common stock dividends, however, should be expected this year. Under the laws of Massachusetts a street railway company cannot pay its stockholders more than 8 per cent. in dividends without dividing such surplus dividends equally with the State. The Massachusetts Electric Companies is the sole owner of the stocks of its two constituent operating properties—the Lynn and Boston and Old Colony street railways, and dividends of 8 per cent. on the stocks of both of these latter companies will be sufficient to show only 2 per cent. for Massachusetts Electric common after the payment of interest on debenture notes and 4 per cent. on the preferred stock.

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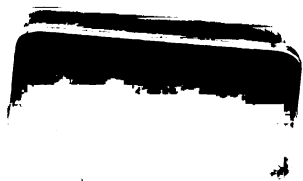
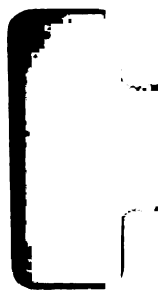
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